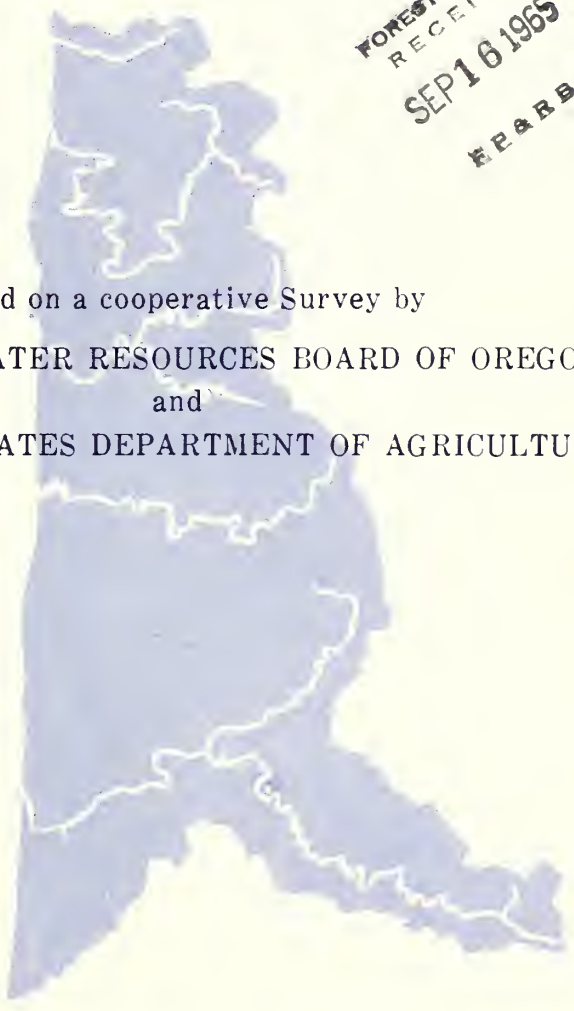
USDA Report on
WATER and RELATED LAND RESOURCES

MIDDLE COAST DRAINAGE BASIN
OREGON



Based on a cooperative Survey by

THE STATE WATER RESOURCES BOARD OF OREGON

and

THE UNITED STATES DEPARTMENT OF AGRICULTURE

Prepared by · · ECONOMIC RESEARCH SERVICE · · FOREST SERVICE · ·
SOIL CONSERVATION SERVICE

September 1964

cc: Beattie

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USDA Report on

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MIDDLE COAST DRAINAGE BASIN

OREGON

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September 1964

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FIGURES

MAPS

INTRODUCTION

This report presents information concerning the water and related land resources of the Middle Coast Drainage Basin and is the result of a cooperative study by the U. S. Department of Agriculture and the State Water Resources Board of Oregon.

The State Water Resources Board of Oregon is making a survey and investigation of the Middle Coast Drainage Basin to develop information needed for planning the coordinated development of the area's water resources. The information needed for its study includes: (1) the kind and location of desirable water resource developments; (2) the amounts of water required; (3) the physical opportunities for developments to meet water needs; and (4) the broad economic aspects of possible development. The State will use this information to formulate and implement plans and programs to secure the most beneficial use and control of the area's water resources. The State's programs are intended, by legislative decree, to be dynamic in nature with provision for changes as new information is available and as the physical or economic situation changes. The current survey is only the beginning of the State's work in this area.

Upon request of the State Water Resources Board, the U. S. Department of Agriculture cooperated in this survey under the provisions of section 6 of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, as amended).

The broad objectives of the cooperative survey were to gather basic data and information pertinent to the use and control of water for agriculture in the area, to highlight such major water related problems as erosion, flood prevention, and drainage, and to outline a general program for water and related land resource management to be used as a background for future detailed study and planning.

This report should be of use to anyone interested in the area's land and water resources. It should be of value in appraisal of present and future use of water for agriculture in relation to other water uses for planning, evaluation, development, and operation of the various agricultural programs of federal, state, and local agencies.

The survey consisted partly of an accumulation and evaluation of previously recorded data, both published and unpublished, much of which was furnished by other cooperating groups. In addition, the USDA River Basin Survey Party made limited studies to gather basic information that was not otherwise available including physical characteristics of certain reservoir sites, land and water availability and use, problems and needs for many tributary watersheds, and forest land resources and ownership. These were not

detailed surveys; much of the information was obtained through consultation with local, public, and private officials. The basic data used as a foundation for statistical information presented in this report are in the files of the USDA River Basin Survey Party.

Several agencies and organizations provided helpful assistance in making this survey. The field offices of the Soil Conservation Service furnished much of the basic information concerning reservoir sites and tributary watersheds. The County Extension Service also assisted in the collection of tributary watershed data. Most of the land status information was obtained from County Assessor's records of the counties concerned. Much information on the forest land was furnished by the various field offices of the Forest Service, the Pacific Northwest Forest and Range Experiment Station, the Bureau of Land Management, and the State Forester of Oregon. Some of the agricultural data were obtained from publications of the Bureau of the Census. Several of these agencies also provided helpful consultation and comment concerning the preparation of this report. In accordance with the cooperative agreement, the State Water Resources Board developed and furnished information concerning existing water rights, major resources and their use, and other pertinent information in addition to furnishing hearing reports and maps.

USDA REPORT ON WATER AND RELATED LAND RESOURCES

MIDDLE COAST DRAINAGE BASIN, OREGON

SUMMARY

GENERAL DESCRIPTION OF THE BASIN

The Middle Coast Drainage Basin of Oregon includes all coastal drainages between the Umpqua River and Cascade Head. It has a humid climate with a strong marine influence characterized by high precipitation during the winter months and by moderate year around temperatures.

The Coast Range Mountains, which form the headwaters of these streams, were formed by a regional upwarping in late Cenozoic time. After the major uplift, the area underwent minor faulting and much gentle folding. The rock formations of the area are of sedimentary and volcanic origin and yield only small quantities of ground water. Soils in the basin can be divided into those derived from alluvium, marine sediments, igneous materials, and sedimentary rock.

Early exploration was hampered by the densely forested Coast Range. The first settlers arrived at Lorane in 1850 and at the site of Newport in 1855. Early homesteading was for agricultural purposes, but was later influenced by the value of timber.

The basin's population in 1960 was 36,750. The economy of the basin is based upon four industries--forestry, recreation, agriculture, and fisheries--all of which are resource oriented. The forest industry has been the most important contributor to economic growth or decline. After a long period of growth, population has declined. Even with out-migration occurring, unemployment has increased since 1960. With the decline of the timber industry, the Middle Coast area is exploiting its "amenity resources"--climate, coastline, and recreational opportunities. Recently there has been a notable increase in construction of "second homes" and "retirement homes". All sectors tied directly or indirectly to recreational activities have shown steady increases in employment since 1940.

Ninety-one percent of the basin is classed as forest; three percent is cropland; one percent is range; and the remaining five percent is devoted to other uses. About 47 percent of the total is publicly owned.

RECREATION RESOURCES IN THE BASIN

Coastal areas provide the opportunity for many active and passive recreational activities. The major recreational opportunities are found along the ocean beaches, with decreasing use and opportunities in the tidewater and interior portions of the basin.

The shoreline is a complex of wide sandy beaches and bluff or rock areas. Nationally famous sand dunes are found along the southern shoreline. The shoreline in the northern portion is much more rugged with several rocky headlands dropping straight into the ocean.

Because of relatively mild weather, year round use occurs. During 1963, over five million recreational visits were made to the basin, primarily for sightseeing, fishing, picnicking, and camping. The Forest Service anticipates an eightfold increase in recreational use of national forest areas within the basin between 1963 and 2000.

Areas with wide sandy beaches are expected to receive the greatest increase in future use. By the year 2000, the demand for recreational shoreline of all types will increase to such an extent that in areas of metropolitan impact, most of the shoreline will be needed to satisfy recreational demand.

The public recreational facilities available are varied, ranging from exclusive resorts to primitive camping areas. Because of increased use, a concerted effort has been made to provide approved water supplies and modern sanitation facilities. Because of the many proposals for recreational development, it is not possible to forecast the route future development will take. It is anticipated that facilities will be provided to the extent possible by whoever is charged with the management of this resource.

The wildlife resources including black-tailed deer and Roosevelt elk provide a significant portion of the recreational attraction in the basin.

All of the major streams have anadromous fish. Salmon fishing was good to excellent on all streams during 1961-62, but the steelhead angler success was fair to poor on most streams. The anadromous fishery is extremely important, and every effort should be made to protect and improve spawning areas and fish access on all streams.

All species of game fish common to the state are found here. Warm water species are found in the dune lakes while species which prefer cooler habitat are found in the streams.

Forecasts indicate that most recreational development will be in the vicinity of water. Because of the importance of water-centered recreation, it must be considered as a major beneficial use in this area. Water and streambed conditions must be protected and improved to enhance the local fishery resource.

FOREST LAND MANAGEMENT IN THE BASIN

The forests, which cover 91 percent of the basin, are composed mainly of Douglas-fir, western hemlock, Sitka spruce, western red cedar, and red alder. Fifty-one percent, or 701,054 acres, is publicly owned.

The major uses of forest land are production of commercial timber, water production, and outdoor recreation. There is considerable variation in the way in which forest land is managed. The national forests are managed under the "multiple use-sustained yield" concept. Forests owned by large timber companies are also generally managed for sustained yield of forest products.

Fire protection of the forest resources is shared by the Federal Government, the state, and rural fire protection districts. The major causes of fire on the Siuslaw National Forest in 1963 were campfires, smoking, logging, and lightning. Protection from insect, disease, and animal damage is the responsibility of the landowner. Insect and disease damage is presently endemic. There are areas where there is significant deer damage to young trees.

Approximately 1,374,000 acres are classed as commercial forest land and contain about 47 billion board feet of softwood timber. This land has an estimated annual sustained yield potential of 765 million board feet. The basin contains some of the best timber growing sites in the state. Logging began with the first settlers. Sawmilling began later and expanded until 1952. It has since declined in both number of sawmills and volume of lumber.

Harvest practices have evolved from clearcut by drainage to clearcut by scattered units. Cable systems are now generally used on steep slopes while tractors are used on flatter ground. Most timber is presently transported by trucks. Slash is generally burned immediately following timber harvest. The clearcuts are reforested the winter after burning because brush takes over the site if reforestation is delayed.

There are approximately 37,000 acres of grazed forest land in the basin.

Few quantitative estimates have been made of water requirements on forest land, but generally needs are expected to increase for domestic and recreation, remain stable for fire control, livestock and wildlife, and decline for industrial uses.

It is essential that all resource managers include control of erosion in their plan of management and that they think of water and soil as resources of value like trees and forage.

AGRICULTURE IN THE BASIN

Agriculture in the basin revolves around the production of forage for livestock. The land base for agriculture consists of 37,000 acres of grazed forest land, 15,480 acres of rangeland, and 42,850 acres of cropland.

With the exception of the larger dairy farms and some of the livestock ranches, farming in the basin is a part-time endeavor. Most of the part-time farmers work as loggers or in one of the jobs related to the forest industry.

Livestock products accounted for 74 percent of the basin's $3.7 million farm income in 1959; farm forest products accounted for 18 percent; and crops accounted for 8 percent. Although dairy products are still the most important source of income, receipts from beef cattle are increasing rapidly while receipts from dairy products have remained stable.

Irrigated acreage in the basin varies from year to year depending on moisture conditions and needs for forage. It is estimated that of the 6,420 acres developed for irrigation in the basin, about 4,300 acres, or 10 percent of the cropland, was irrigated in 1959. About 96 percent of the irrigated acreage is used for producing forage crops.

Opportunities for expanding irrigated acreage in the basin appear limited from both a physical and economic standpoint. It is estimated that an additional 29,590 acres in the basin could readily be irrigated. In many cases, flooding and drainage are problems on irrigable land.

It is anticipated that forage production will continue to be the most important cropland use in the basin. Thus, the demand and prices for dairy and livestock products and the relative competitive situation between this area and other producing areas will have a bearing on irrigation development. Another factor that will affect the demand for irrigation water is the recent trend in shifts of river frontage land into summer homesites and recreational use.

WATER RELATED PROBLEMS, NEEDS, AND OPPORTUNITIES

Problems peculiar to the individual uses and management practices on crop, forest, and range lands influence the quality, quantity, and use of water. Water, in turn, influences all segments of the economy.

Average annual precipitation in the Middle Coast Drainage Basin ranges from about 35 to 200 inches, but less than 10 inches fall during June through September.

Average annual surface water yield after consumptive use is about 8,451,000 acre feet. About four-fifths of the precipitation runs off in the form of surface water.

Approximately 12,900 acre feet, or only about 3 percent of the surface water yield during the irrigation season, is used to irrigate 6,420 acres of land. However, there are water supply problems in some areas, and irrigation expansion would be limited without storage.

From an agricultural standpoint, arable land is the more limited resource when compared to water.

There is usually an adequate water supply for livestock and forest related uses.

There are two main sources of floodwaters, rapid runoff of rain and melting snow and ocean tidal action. Most floods from rain and snow occur during the November through March heavy precipitation period. Evaluated agricultural flood damages consist mostly of crop and property damage; however, land damage from erosion and deposition is significant although it is difficult to evaluate and is probably inadequately appraised.

Irrigation is a major consumptive use of water in the basin. It has been developed by the efforts of individuals. Water is almost always pumped from streams and applied by the sprinkler method.

Approximately 23,200 acres, or about 16 percent of the arable soils, has a major drainage problem.

Careful management of forest and range resources and recreational sites can result in maximum economic and social benefits without impairment of soil and watershed values. However, improper management of these resources can produce or intensify flood, erosion, water quality, and water quantity problems.

There is potential for development of the water resources of the basin to better serve all phases of the economy. Surface water, ground water, and stored water can all be used to advantage to help meet the increasing water requirements of the area. There are many potential water storage sites, both large and small, that could be developed for multipurpose use to aid in the future development and growth of the area. Fifty medium-sized sites are pointed out in this report.

OPPORTUNITIES FOR WATERSHED PROTECTION AND FLOOD PREVENTION PROJECTS

The USDA River Basin Survey Party made a study of the potential for P. L. 566 projects in the Middle Coast Drainage Basin to provide information as a guide to long range coordination and planning. The basin was divided into 20 tributary watersheds, and a reconnaissance and summary report was made on each. It was concluded that five projects appear to be feasible and that three projects might prove feasible, but a more detailed study is required to make a decision. However, five other watersheds have subareas that might prove feasible with more detailed study.

The watersheds with best possibilities for projects are those with a high potential for agricultural and/or urban development with localized flooding, drainage, and water supply problems that cannot be solved by individual action.

GENERAL DESCRIPTION OF THE BASIN

PHYSICAL FEATURES

Location and Size

The Middle Coast Drainage Basin of Oregon includes all coastal drainages between the Umpqua River Basin and Cascade Head (map 1). It is bounded by the Pacific Ocean on the west, the Umpqua River Basin on the south, the Upper and Middle Willamette River Basins on the east, and the North Coast Drainage Basin on the north. The basin has a total area of 1,511,400 acres which is about 2.4 percent of the total area of Oregon. It contains most of Lincoln County, approximately one-fourth of Lane and Benton Counties, and minor portions of Douglas, Polk, and Tillamook Counties. The main drainages are the Siuslaw, Yachats, Alsea, Yaquina, Siletz, and Salmon Rivers.

For the purpose of this report, the Middle Coast Drainage Basin is divided into twenty small watersheds. These watershed areas vary in size from 7,200 acres to 195,000 acres.

Climate

The Middle Coast Drainage Basin has a humid climate with a strong marine influence characterized by high precipitation particularly during the winter months and by moderate year-round temperatures. The mountainous topography produces considerable local variation in the climate.

The annual precipitation is 60 to 90 inches along the immediate coast but increases inland to as much as 200 inches along the summit of the Coast Range. In the Lorane area, the annual precipitation is as low as 35 inches (map 2). Approximately 70 percent of the precipitation occurs from November through March often in moderate to heavy rain storms that produce up to 6 inches or more in a 24-hour period. The normal annual snowfall varies from a trace near the coast to several feet in the higher elevations, where it may accumulate to a depth of 2 to 4 feet and remain through the winter. Winter snow accumulations do not materially affect the streamflow pattern in this area. Summer precipitation is limited to occasional light rain storms, relatively rare thundershowers, and coastal fog.

The prevailing winds are generally from the west and northwest. During stormy periods, the prevailing wind is from the south to southwest and may reach destructive velocities. Continuous wind velocities of from 15 to 25 miles per hour are common along the immediate coast. The wind velocities are more moderate in the inland valleys, but strong winds caused by daily

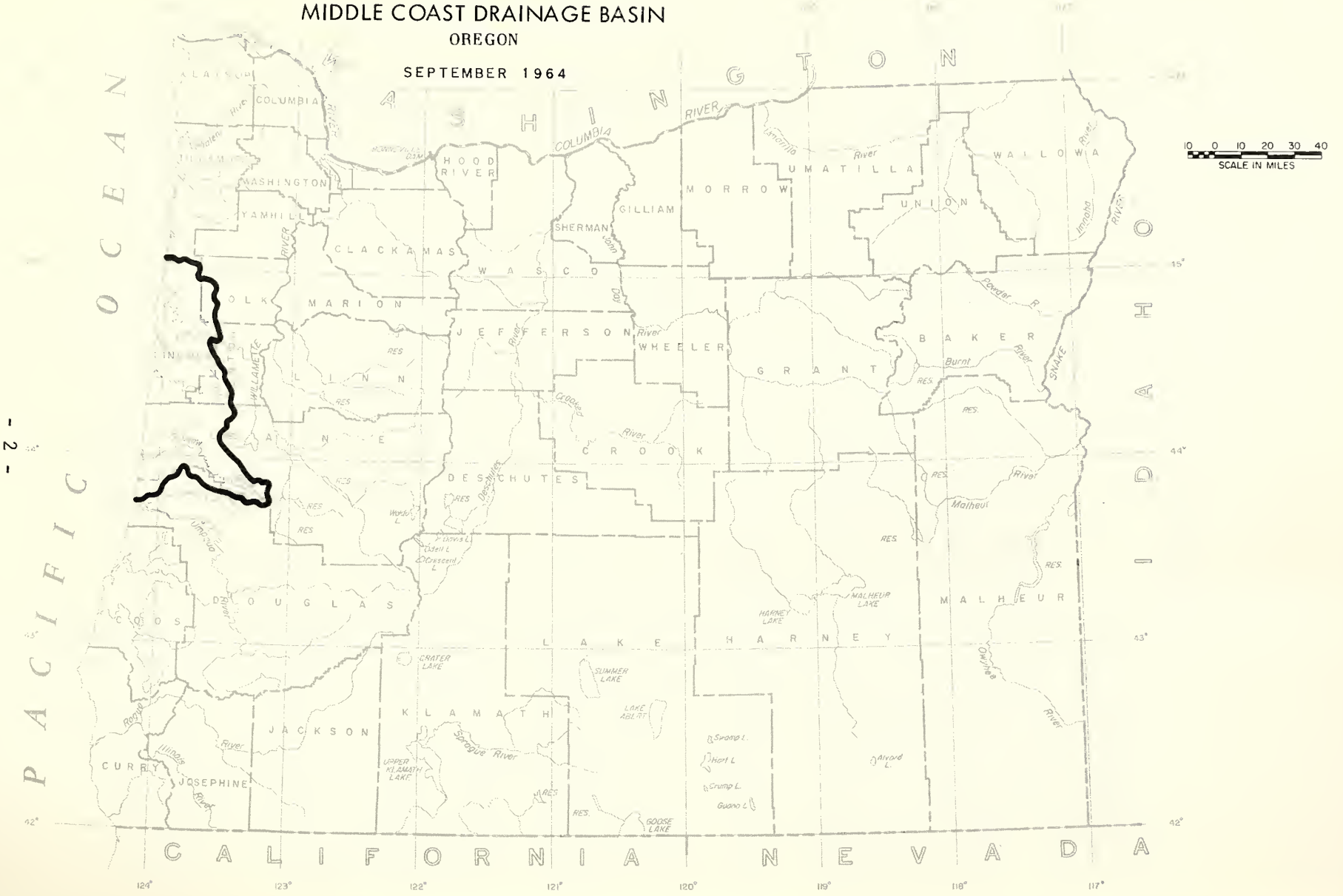
MAP 1

LOCATION MAP

MIDDLE COAST DRAINAGE BASIN

OREGON

SEPTEMBER 1964



Source U.S. WEATHER BUREAU

LEGEND

- Drainage Basin Boundary
- National Forest Boundary
- Watershed Boundary
- 70 Normal Annual Precipitation in Inches

WATERSHEDS

- A SALMON RIVER
- B DEVILS LAKE
- C SILETZ RIVER
- D OTTER ROCK
- E YAQUINA RIVER
- F BEAVER CREEK
- G ALSEA RIVER
- H UPPER ALSEA RIVER
- I WACONDA BEACH
- J YACHATS RIVER
- K FIVE RIVERS
- L LAKE CREEK
- M NORTH LANE COAST
- N NORTH FLORENCE
- O NORTH FORK SIUSLAW RIVER
- P SIUSLAW RIVER
- Q WILDCAT CREEK
- R UPPER SIUSLAW RIVER
- S DUNCAN SLOUGH
- T SILTCOOS LAKE

DRAINAGE BASIN LOCATION

COUNTY LOCATION

MAP 2

PRECIPITATION MAP

MIDDLE COAST DRAINAGE BASIN

OREGON

SEPTEMBER 1964

2 0 2 4 6 8 10

SCALE IN MILES

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temperature variations are common in narrow canyons and on upper mountain slopes during the summer. Occasional short periods of strong easterly winds may occur at any time of the year.

High relative humidities are common all year except during the easterly wind periods.

The winter temperatures are mild, seldom below 20 degrees even in the mountains. The summer temperatures are cool in the coastal fog belt but are fairly high further inland; even here temperatures above 100 degrees are rare.

The average frost-free season varies from around 250 days along the coast to about 140 days in the mountains. The average frost-free season in most of the agricultural area is 180 days or more.

Topography and Geology

The Coast Range Mountains were formed by a regional upwarping in late Cenozoic time. The Middle Coast Drainage Basin is located on the west slope of this geanticline. The coast line, which is relatively straight with broad sandy beaches between rugged volcanic headlands, is the west edge of the basin (map 3). From the coast, the basin extends eastward to the summit of the Coast Range, a distance of 14 miles at the Salmon River drainage and 50 miles at the Siuslaw River drainage. Elevations along the summit vary from 700 to 4,097 feet with an average of about 1,500 feet. Topographic highs of hard intrusive rock occurring throughout the basin are caused by differential erosion. Well know peaks include: Marys Peak, 4,097 feet; Table Mountain, 2,804 feet; Stott Mountain, 3,128 feet; Euchre Mountain, 2,446; Sugarloaf Mountain, 3,534 feet; Prairie Peak, 3,400 feet; Grass Mountain, 3,500 feet; Saddleback Mountain, 3,100 feet; Saddle Mountain, 2,297 feet; Roman Nose Mountain, 2,856 feet; and Klickitat Mountain, 2,307 feet.

After the major uplift, the area underwent minor faulting and much gentle folding; however, in two sections, major faulting has occurred. The Siletz River follows a structural valley which was formed by faulting. The northeast-southwest oriented Marys Peak-Alsea section was uplifted between major faults. The rivers and streams have carved most of the present topography by extensive dissection and erosion, developing a dendritic and radial drainage pattern.

The oldest rock in the Middle Coast Drainage Basin is the Siletz River volcanics. The type location is the upper Siletz River valley. This early Eocene series consists of a great thickness of dark gray to greenish gray, submarine lava flows, flow breccias, pyroclastic rocks, and tuffaceous sedimentary rocks. It forms the basement complex of the entire basin; however, it is only exposed in the two extensive block fault areas. In these uplifted areas, the softer overlying sedimentary rock was eroded away.

The most widespread formation, the middle Eocene Tyee, is the surface rock in more than two-thirds of the basin. This sedimentary formation consists of 6,000 to 7,000 feet of bluish-gray to gray, rhythmically bedded

sandstone and sandy siltstone. Each bed ranges in thickness from 6 inches to 12 feet and is composed of a basal portion of medium- to coarse-grained highly micaceous arkosic sandstone that gradually grades upward through finer-grained arkosic sandstone into siltstones and mudstones.

Volcanic rocks of late Eocene age compose the range of hills between the Yachats and Siuslaw Rivers and the hills north of the mouth of Salmon River. These rocks which may be correlated with the Goble volcanic series make up the bold headlands - Heceta Head, Cape Perpetua, and Cascade Head.

A bewildering array of marine sandstone, mudstones, and conglomerates and volcanic ash beds was deposited unconformably upon the Tyee formation in the coastal area between the Yachats and Salmon drainages. These upper Eocene to middle Miocene formations with an aggregate thickness of nearly 10,000 feet include the Toledo, Yaquina, Nye mudstone, and Astoria.

East of Lorane in the upper Siuslaw valley, the late Eocene tuffaceous beds of the Spencer formation unconformably overlies the Tyee. The late Eocene to upper Oligocene Fisher formation of approximately 1,500 feet of volcanic tuff and conglomerate rests on the Spencer.

The Eocene sedimentary rocks have been abundantly intruded by dikes and sills in late Oligocene to early Miocene time. Erosional remnants of these sills cap nearly every prominent peak. In some places, dikes constrict the valleys and create low falls and rapids.

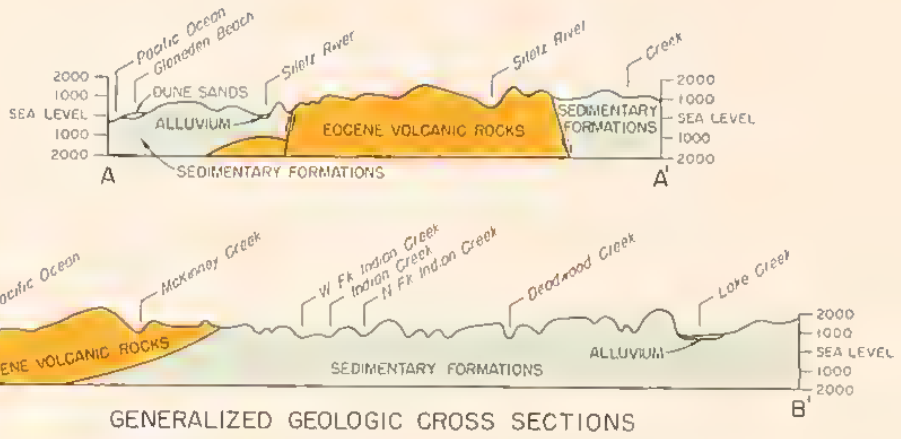
Structural changes occurred in the Miocene epoch. In early Miocene time, the Coast Range was uplifted and subsequently eroded to a plane of low relief. A small area of middle Miocene Columbia River basalt at Depoe Bay remains as a remnant of a greater extrusion. This event was followed by the uplift of the Coast Range to its present elevation.

Pleistocene sea level changes due to continental glaciation have cut sea terraces along the Lincoln County coast which now exist at elevations up to 250 feet. The sea level changes provided alternate environments of downcutting and deepening of the stream channels followed by alluviation, filling, and drowning of stream mouths to form bays. On the beaches along the coast, ocean-carried sandy sediments have accumulated in varying quantities. Along the Lane County coast, a large amount of sand has been deposited and has been gradually moved inland by wind action. This sand has formed spits in some stream bays and has cut off the outlet of other streams to form lakes such as Siltcoos Lake.

Ground water is found in only small quantities in the rock formations of the basin; however, considerable water may exist along the flow contacts in the Siletz River volcanics. Moderate amounts of water may be present in the alluvial deposits along the streams. Large quantities have been found in the dunes along the Lane County coast.

Soils

The four general groups of soils found in the basin are those derived from alluvium, marine sediments, igneous materials, and sedimentary rock.



GENERALIZED GEOLOGIC CROSS SECTIONS

LEGEND

- Alluvium
- Dune Sands
- Columbia River Basalt
- Sedimentary Formations
- Eocene Volcanic Rocks
- Anticline Axis
- Syncline Axis
- Fault Traces
- Drainage Basin Boundary
- National Forest Boundary
- Watershed Boundary

WATERSHEDS

A SALMON RIVER
B DEVILS LAKE
C SILETZ RIVER
D OTTER ROCK
E YAQUINA RIVER
F BEAVER CREEK
G ALSEA RIVER
H UPPER ALSEA RIVER
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N NORTH FLORENCE
O NORTH FORK SIUSLAW RIVER
P SIUSLAW RIVER
Q WILDCAT CREEK
R UPPER SIUSLAW RIVER
S DUNCAN SLOUGH
T SILTCOOS LAKE

DRAINAGE BASIN LOCATION

COUNTY LOCATION

MAP 3

GENERALIZED GEOLOGIC MAP

MIDDLE COAST DRAINAGE BASIN

OREGON

SEPTEMBER 1964

2 0 2 4 6 8 10
SCALE IN MILES

The factors of soil formation which have determined the different soils are: geologic, source and kind of parent and underlying material; topographic, kind and shape of landform; climatic, temperature and precipitation; living organisms, differentiation of horizons in the profile; and time. The areas in which each of these groups of soils occur are delineated on the generalized soil map (map 4). The narrative includes a general description of each of these groups. The table of soil characteristics (table 1) lists the soil series included in each group and shows some of the prominent characteristics of each series.

Soils Derived from Alluvium. Upland soils of various origin and mineralogy are the source of parent material for the alluvial soils which occupy terraces, fans, and flood plains. Flood plains occur between the streams and the adjacent but slightly higher terraces. Fans, or footslopes, of alluvium and colluvium were deposited at the place where the valley wall meets the valley floor.

The soil profile development varies from practically none in the flood plain soils through weak development in the fan soils to weak to moderate development in the terrace soils. The alluvial soils vary from moderately shallow to very deep and they overlie silt, sand, gravel, or bedrock. They are found on slopes which vary from nearly level to moderately sloping. They are suited for agriculture, forest, urban, recreation, road construction, and other uses. They were homesteaded and cleared by early settlers and still support most of the agricultural development in the basin.

Soils Derived from Marine Sediments. Great quantities of uniform sized, mostly quartz sand was deposited in dunes along the coast in depths of 100 to 200 feet, rising to elevations as high as 250 feet above sea level. The oldest marine sediments are semi-consolidated and the youngest are loose, nonvegetated dune land that the ocean winds constantly move eastward. Intermittent areas of peat, thin lenses of silt and clay, and cemented layers and hardpan occur in places.

The topography is undulating and dune-like with long parallel ridges and smooth slopes. The slopes vary from nearly level to strongly sloping. These soils are suited for urban and recreation use, and, to a lesser degree, agriculture, forest, and road construction. Being very unstable and erodible when the vegetation is removed, they require careful treatment when used for any purpose (photo 1).

Soils Derived from Igneous Materials. In the mountainous upland areas, colluvial/residual soils have formed from igneous materials, including basalt, gabbro, diorite, and syenite rocks, consolidated tuffs, and interbedded tuffaceous sandstone. They occupy approximately 17 percent of the basin and occur in four separate portions. Erosion has shaped this area into typical mountain topography with maturely dissected drainages and a few relatively wide ridgetops.

Profile development varies from moderate to strong. Some soils have cobbles or pebbles intermixed throughout the profile and some possess a high slump potential. Depth varies from shallow to very deep with the majority of soils moderately shallow to deep. The slopes are smooth to uneven, of variable length, and gently sloping to extremely steep, varying from 3 to

Photo 1.--Wind action has shaped this coarse textured soil into dune topography. SCS photo NO. 7-1496-11

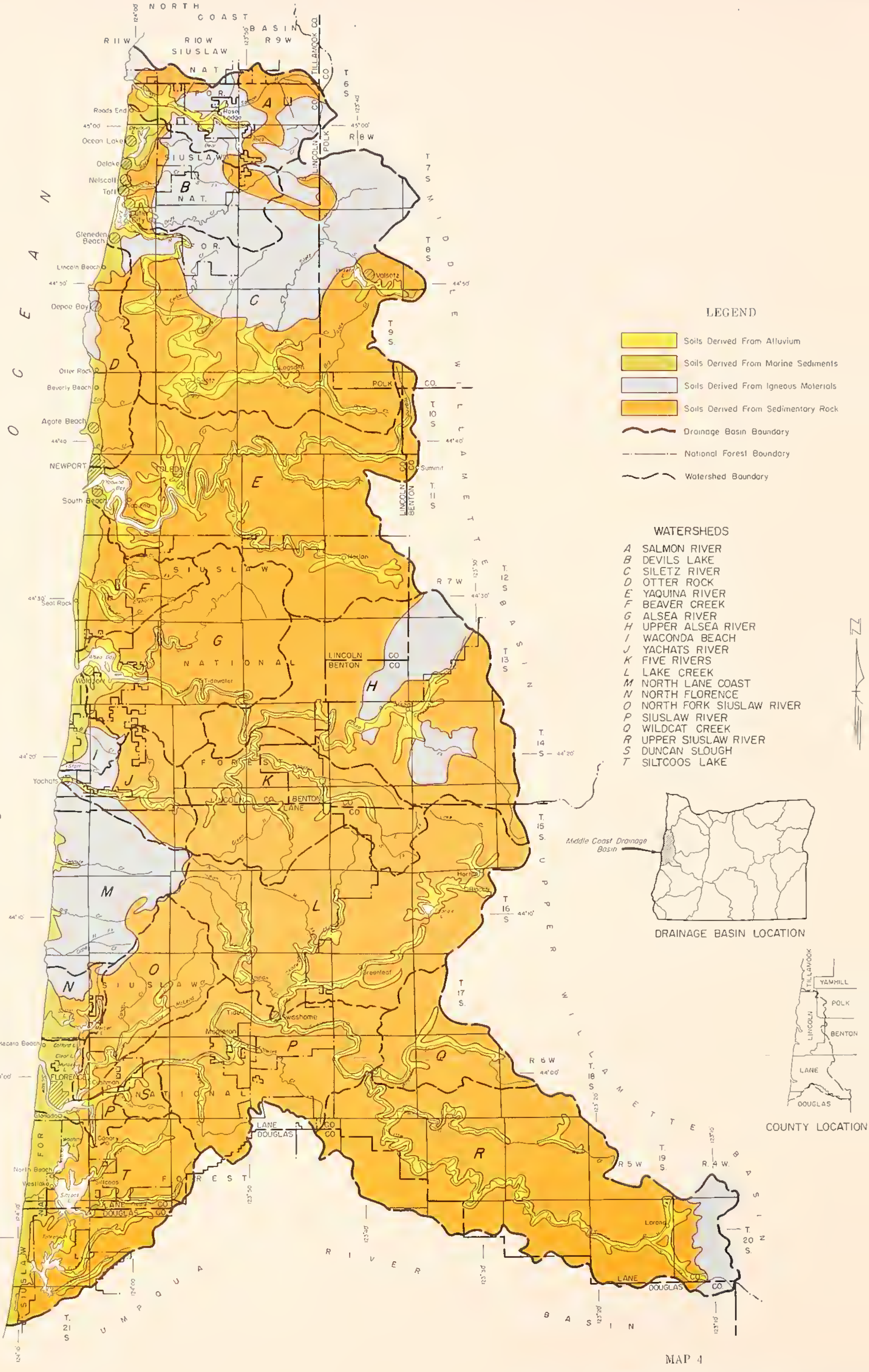
90 percent gradient. These soils are well suited for forest production and are also suited for recreation, wildlife, and watershed protection.

Soils Derived from Sedimentary Rock. A large portion of the basin is mantled by soils formed in material from rock formed from marine sediments. The greater part of the parent rock is micaceous and arkosic sandstone and sandy siltstone. In addition, there are smaller areas of mudstone and shale and, in areas adjacent to volcanic rock, tuffaceous sandstone or rocks with a mixture of tuffaceous and marine sediments. The topography is a typical mountain topography with a dendritic pattern of maturely dissected drainages.

These soils have moderately to strongly developed, moderately fine to fine textured profiles. Some have cobbles or pebbles intermixed in all or a portion of the profile, and some have a high slump potential. Depth varies from shallow to very deep with most varying from moderately shallow to deep. The slopes are smooth to uneven, of variable length, and nearly level to very steep, varying from 0 to 75 percent gradient. Forest, recreation, wildlife, and watershed protection are the uses of these soils, and they are especially suited for timber production.

Land Capability

An interpretive grouping of soils into land capability classes has been developed by the Soil Conservation Service. Soil characteristics such as depth, texture, wetness, slope, erosion hazard, overflow hazard, permeability,



MAP 4

GENERALIZED SOIL MAP

MIDDLE COAST DRAINAGE BASIN

OREGON

SEPTEMBER 1964

Table 1.--Characteristics, qualities, and other data of soils, Middle Coast Drainage Basin, Oregon, 1964 1/

Soil groups	Classification	Texture surface soil	Reaction surface soil pH value	Texture subsoil	Profile depth Inches	Drainage class	Permeability	Water-holding capacity Inches	Infiltration	Major land use	Special problems	Elevation Feet	Precipitation Inches	Growing season Days
Soils derived from sedimentary rock:														
Apt 2/	Reddish Brown Lateritic	Clay	5.1-5.5	Silty clay to clay	60+	Well to moderately well	Moderate	11	Medium	Forest	Erosion on steeper slopes	500-1500	60-110	160-200
Astoria	Sol Brun Acide	Silt loam	5.1-5.5	Silty clay loam to silty clay	36-60	Well	Moderate	7-12	Medium	Forest and pasture	Erosion on steeper slopes	100-2000	60-100	160-200
Blachly 2/	Sol Brun Acide	Silt loam	5.1-6.0	Silty clay	36-60	Well	Moderately slow	10	Medium	Forest and pasture	Erosion on steeper slopes	250-2500	80-120	160-200
Bohannon 2/	Sol Brun Acide	Loam to clay loam	4.5-5.0	Loam to clay loam	60+	Well	Moderately rapid	10-12	Medium	Forest	Erosion on steeper slopes	100-4000	80-120	160-200
Digger 2/	Sol Brun Acide	Loam	5.1-5.5	Loam to clay loam	20-40	Well	Moderately rapid to rapid	4	Medium	Forest	Erosion on steeper slopes	200-1800	60-80	160-200
Fendall 2/	Sol Brun Acide	Clay loam	4.5-5.5	Clay	25-40	Well	Moderate	4.5-7	Medium	Forest	Erosion on steeper slopes	50-450	60-80	160-200
Honeygrove 2/	Reddish Brown Lateritic	Clay	6.1-6.4	Clay	60+	Well	Moderately slow to slow	11.5	Slow	Forest	Erosion on steeper slopes	500-1500	60-80	160-200
Panther 2/	Humic Gley	Silty clay loam	6.1-6.5	Clay	20	Poorly	Very slow	3.5	Medium	Pasture	Drainage - claypan	500-1500	35-50	160-200
Peavine 2/	Reddish Brown Lateritic	Silt loam	5.2-6.0	Silty clay	36-48	Well	Moderate	8	Medium	Forest and pasture	Erosion on steeper slopes	500-2500	60-80	160-200
Preacher 2/	Sol Brun Acide	Clay loam	4.5-5.0	Clay loam to silty clay	60+	Well	Moderate	11	Medium	Forest	Erosion on steeper slopes	250-2500	80-120	160-200
Sharps 2/	Sol Brun Acide	Gravelly clay loam	4.5-5.0	Gravelly clay loam	50	Well	Moderate to moderately slow	5.5	Medium	Forest	Steep slopes and gravelliness	1000-2500	80-120	160-200
Slickrock 2/	Sol Brun Acide	Gravelly loam	4.5-5.0	Gravelly clay loam	55	Well to moderately well	Moderate	5-8	Medium	Forest	Steep slopes and gravelliness	250-2500	80-120	160-200
Steiwer 2/	Brunizem-like	Silt loam	5.1-5.5	Silty clay	24-36	Well	Moderate	4-6	Medium	Forest, pasture, cropland	Erosion on steeper slopes	500-2500	35-60	160-200
Sutherlin	Planosol or Gray Brown Podzolic	Silt loam	5.6-6.0	Clay	38	Moderately well	Slow to very slow	4-6	Medium	Pasture	Drainage - clay subsoil	500-2000	35-60	160-200
Trask	Lithosol or Sol Brun Acide	Loam	4.5-5.0	Loam	24	Well	Moderate	2-4	Medium	Forest	Stoniness and steep slopes	500-2500	80-100+	140-200
Trout 2/	Reddish Brown Lateritic	Clay	5.1-5.5	Clay	50	Well	Moderately slow to slow	9	Slow	Forest	Fine textured profiles and steep slopes	500-1500	60-80	160-200
Willakenzie 2/	Reddish Brown Lateritic	Silt loam	5.6-6.0	Silty clay loam	36-60	Well	Moderate	6-9	Medium	Forest, pasture, cropland	Erosion on steep slopes	500-2000	35-60	160-200
Winema	Ando	Silt loam	4.5-5.0	Silty clay	60+	Well	Moderately slow	10	Medium	Pasture	Erosion on steep slopes	50-500	60-90	180-200
Soils derived from igneous materials:														
Cannibal 2/	Sol Brun Acide	Gravelly loam	4.5-5.5	Gravelly loam	24-48	Well	Moderately rapid	2-4	Medium	Forest	Steep slopes and gravelliness	1900-2700	100-120	150-180
Desolation 2/	Sol Brun Acide	Clay loam	4.0-4.8	Clay to silty clay	60+	Well	Moderate	10-11	Medium	Forest	Erosion on steeper slopes	300-1700	60-100	180-200
Hatchery 2/	Sol Brun Acide	Gravelly loam	5.1-5.5	Gravelly loam	25-35	Well	Rapid to moderately rapid	3.5	Medium	Forest	Steep slopes and gravelliness	250-1500	60-80	160-200
Hembre	Sol Brun Acide	Silt loam	4.5-5.0	Silty clay	48-60	Well	Moderate	8-10	Medium	Forest and pasture	Erosion on steeper slopes	200-2500	70-130	160-200
Kilchis	Lithosol or Sol Brun Acide	Loam	4.5-5.0	Loam	12-24	Well	Moderate	2-4	Medium	Forest	Steep slopes and stoniness	1500-4000	80-120	160-200
Klickitat 2/	Sol Brun Acide	Gravelly clay loam to loam	5.1-5.5	Gravelly clay loam	47	Well	Moderately rapid to moderate	4	Medium	Forest	Erosion on steeper slopes	500-2700	80-120	160-200
Lobster 2/	Ando	Loam	4.1-4.9	Stony loam	20-35	Well	Moderately rapid	2	Medium	Pasture	Shallow depth and stoniness	1500-4100	80-120	120-200
Marty 2/	Sol Brun Acide	Silty clay loam	4.5-5.0	Clay	60+	Well	Moderately slow	11.5	Medium	Forest	Erosion on steeper slopes	500-4100	80-120	160-200
Nekia 2/	Reddish Brown Lateritic	Silt loam	5.4-5.6	Silty clay	36-48	Well	Moderate	7-9	Medium	Forest and pasture	Erosion on steeper slopes	400-1200	35-80	160-200
Neskowin	Ando	Silt loam	5.0-5.5	Silty clay loam	36-48	Well	Moderate	6-8	Medium	Pasture	Erosion on steeper slopes	50-500	70-90	180-200
Shotpouch 2/	Sol Brun Acide	Gravelly loam	5.1-5.5	Very gravelly loam	30-60	Well	Moderate to moderately rapid	2.5-5	Medium	Forest	Steep slopes and gravelliness	500-4100	80-100	160-200
Skinner 2/	Sol Brun Acide	Gravelly clay loam	4.5-5.0	Cobbly clay loam	30-60	Well	Moderately rapid	5	Medium	Forest	Steep slopes and gravelliness	300-1700	60-100	160-200
Tobe 2/	Reddish Brown Lateritic	Clay	4.5-5.0	Clay	60+	Well	Moderately slow	11.5	Slow	Forest	Fine textured profiles	500-1500	60-80	180-200
Yachats 2/	Sol Brun Acide	Clay loam	4.5-5.0	Clay	60+	Well	Moderate	11	Medium	Forest	Erosion on steeper slopes	300-1700	60-100	180-200
Zahn 2/	Sol Brun Acide	Clay	5.1-5.5	Clay	60+	Moderately well	Moderate	11	Slow	Forest	Fine textured profiles and steep slopes	500-2700	80-120	160-200
Soils derived from marine sediments:														
On semi-consolidated sediments:														
Blacklock	Ground Water Podzol	Sandy loam	4.0-4.5	Sandy loam	12-30	Poorly	Moderate	1.3-3.2	Medium	Pasture	Drainage - cemented hardpan	20-250	60-90	200-225
Depoe 2/	Ground Water Podzol	Clay loam to loam	4.5-5.0	Clay loam to loam	24-36	Poorly	Very slow	6-8	Slow	Forest	Drainage - cemented hardpan	20-250	60-90	200-225
Ferrelo 2/	Sol Brun Acide	Sandy loam	5.1-5.5	Loam	20-60	Well	Moderate	3-7	Medium	Forest	Erosion on steeper slopes	50-250	60-90	200-225
Nelscott 2/	Sol Brun Acide	Loam	5.0-5.5	Clay loam	60+	Well	Moderately slow	6-8	Medium	Forest	Erosion on steeper slopes	50-250	60-90	200-225
On old stabilized dunes:														
Neterts	Podzol	Sandy loam to fine sand	4.5-5.0	Fine sand	60+	Well	Moderate	6-7	Rapid	Forest	Droughtiness	20-200	60-100	200-225
Warrenton	Ground Water Podzol	Loamy fine sand	5.0-5.5	Loamy fine sand	60+	Poorly	Rapid	5	Rapid	Forest	Drainage - high water table	10-40	60-90	200-225
Yaquina	Podzol	Loamy fine sand	4.5-5.0	Fine sand	60+	Imperfectly	Rapid	5	Rapid	Forest and pasture	Drainage - high water table	10-50	60-90	200-225
On recently stabilized dunes:														
Westport	Regosol	Loamy sand	4.5-5.0	Sand	60+	Well	Rapid	4	Rapid	Forest	Droughtiness	0-30	60-90	200-225
Soils derived from alluvium:														
On terraces, forest vegetation:														
Alsea 2/	Sol Brun Acide	Silt loam	4.5-5.0	Silty clay loam	60+	Moderately well	Moderate	10.5	Moderate	Cropland and pasture	Drainage - seepage	20-300	65-90	160-200
Chitwood	Reddish Brown Lateritic to Humic Gley	Silt loam	5.1-5.5	Silty clay	48	Imperfectly	Moderately slow to slow	10	Moderate	Pasture	Drainage - seepage	50-200	65-100	160-200
Hebo	Humic Gley	Silty clay loam	4.5-5.0	Clay	36-48	Poorly	Very slow	6	Slow	Pasture	Drainage - claypan	20-300	65-90	160-200
Knappa	Sol Brun Acide	Silt loam	4.5-5.0	Silty clay loam	36-60	Well	Moderate	7-12	Moderate	Pasture and cropland	None	20-300	65-100	160-200
Lint 2/	Sol Brun Acide	Clay loam to silty clay loam	4.0-4.5	Silty clay loam	60+	Moderately well	Moderate	11	Medium	Forest	Drainage - dense substratum	50-450	60-90	160-200
Suiman 2/	Reddish Brown Lateritic	Silt loam	4.5-5.0	Clay	36	Moderately well	Moderately slow	8	Moderate	Forest and pasture	Drainage - seepage	40-300	65-90	160-200
On terraces, grass-fern vegetation:														
Delake 2/	Ando	Silt loam	4.5-5.0	Silty clay	60+	Well	Moderately slow	10-12	Moderate	Pasture	Erosion on steeper slopes	50-350	60-90	180-220
Ginger	Ando	Silt loam	4.5-5.0	Silty clay	36	Imperfectly	Moderately slow	6-8	Moderate	Pasture	Drainage - seepage	30-250	60-90	180-220
Quillayute	Ando	Silt loam	4.5-5.0	Silty clay loam	60+	Well	Moderate	8-12	Moderate	Pasture and cropland	None	50-200	60-90	180-220
On fan slopes:														
Chehalem 2/	Brunizem-like	Silt loam	5.0-5.4	Silty clay loam	60+	Imperfectly	Moderate	9.5	Moderate	Forest and pasture	Drainage - seepage	225-1000	35-50	160-200
Meda	Alluvial	Silt loam	5.6-6.0	Sandy loam	48-60	Well	Moderate	8	Moderate	Pasture	None	20-300	60-90	160-200
On floodplains, coastal streams:														
Brenner	Low Humic Gley	Silt loam	5.0-5.4	Silty clay	60+	Poorly	Moderately slow	8	Moderate	Pasture	Drainage - high water table	50-200	60-90	160-200
Clatsop	Low Humic Gley or Alluvial	Silty clay loam	5.1-5.5	Silty clay	36+	Very poorly	Moderately slow	7	Slow	Pasture	Drainage - tidal overflow	0-5	60-100	200-225
Coquille	Low Humic Gley	Silt loam	4.5-5.0	Silty clay loam	36-60+	Poorly	Moderate	6-10	Moderate	Pasture	Drainage - low position	0-10	60-90	160-200
Gardiner	Alluvial	Sandy loam	4.5-5.0	Loamy fine sand	60+	Somewhat excessively	Moderately rapid	5	Rapid	Pasture	Droughtiness	50-200	70-90	160-200
Gauldy	Alluvial	Loam	4.5-5.0	Sandy loam over gravel	36-55	Somewhat excessively	Moderately rapid	7	Moderate	Forest and pasture	Flood inundation	10-200	70-100	160-200
Nehalem	Alluvial	Silt loam	5.0-5.5	Silt loam	60+	Well	Moderate	12	Moderate	Pasture and cropland	None	10-1500	60-90	160-200
Nestucca	Alluvial	Silt loam	5.1-5.5	Silty clay loam	60+	Moderately well to imperfectly	Moderate	10	Moderate	Pasture	Drainage - high water table	20-150	60-90	160-200
Peat	Organic	Muck	4.5-5.0	Muck	24-36	Poorly	Moderate	10	Rapid	Pasture and cropland	Drainage and diking	0-50	70-90	160-200
On floodplains, east edge of basin:														
Maytown	Alluvial	Silt loam	6.4-6.8	Silty clay loam	60+	Imperfectly	Moderate	11.5	Moderate	Forest and cropland	Drainage - high water table	300-800	35-60	160-180
Wapato	Low Humic Gley	Silt loam and silty clay loam	6.0-6.4	Silty clay loam to silty clay	60+	Poorly	Moderate to moderately slow	10	Moderate	Forest and pasture	Drainage - high water table	300-800	35-60	160-180

1/ USDA, Forest Service, and Soil Conservation Service.
2/ Tentative series, not yet correlated.

structure, reaction, water-holding capacity, inherent fertility, and climatic conditions as they influence safe use and management of land are considered in grouping soils into eight land capability classes. These eight classes are designated by Roman numerals as indicated on the generalized land capability map (map 5). The class I land has few hazards or limitations, whereas, class VIII land is so limited that it is unfit for safe or economical use for cropland, forest, and range and should be used only for recreation, wildlife habitat, and water production.

Generally speaking, the classification can be broken into two divisions: (1) land in capability classes I through IV is suited for cultivation and other uses, and (2) land in capability classes V through VIII is best suited for range, forestry, and wildlife because of its limitations. Land capability classes are sometimes broken into subclasses to indicate the dominating limitation or hazard. The subclasses are "e" for wind or water erosion, "w" for wetness or frequent inundation from overflow, "s" for soil limitation, and "c" for climatic limitations.

An estimate of the amounts of land in each watershed has been made for each land capability class and subclass. These data were developed from the Conservation Needs Inventories and soil surveys within the Middle Coast Drainage Basin and are summarized in table 2.

SOCIAL AND ECONOMIC FEATURES

Settlement and History

Explorers and traders sailed along the Oregon Coast in the sixteenth to the eighteenth centuries to explore the coast, trade for furs, or stop enroute to the Philippine Islands or the Orient. The only record of any landings on the coast of this basin is Captain Cook at Yaquina Bay and, possibly, Heceta at the bay just south of the prominent point bearing his name. Captain Cook sighted and named Capes Perpetua and Foulweather. Evidence of unscheduled visits is the boiler from a shipwrecked ship at Boiler Bay and some "English Trade Tokens" dated 1788 that were found on the beaches.

The densely forested Coast Range acted as a barrier to early land explorations and, consequently, delayed exploration and settlement until the coming of fur companies between 1798 and 1826. A notable visit was the honeymoon trip of Jason Lee, Cyrus Shepard, and their brides in 1837 to the north Lincoln beach area. The first official exploration was probably by Lieutenant Theodore Talbot in 1849 who mapped some of the area between Yaquina and Salmon Rivers.

Indians migrated across the mountains to the coastal areas of the basin in the 1840's because of the great influx of white settlers to the Willamette Valley. A treaty between the Indians and the whites at Dayton in 1855 established the Siletz Reservation, which originally included most of Lincoln County north of the Alsea River. In 1866, the southern portion was opened to homesteading, and the boundary was set at an east-west line a few miles north of Toledo. The Indian population of about 4,000 in 1855 had dwindled to 2,313 in 1864 and 550 in 1887. In 1892, the reservation was further reduced

to 47,000 acres and continued to be reduced until the Indian agency was closed in 1925. The last six lots owned by the agency in the town of Siletz were sold in 1962.

The first settlers located in the Lorane area of the upper Siuslaw River in Lane County in 1850, the upper Alsea Valley in 1852, and at the site of Newport in 1855. Early homesteading was for agricultural purposes, but later was influenced by the value of the timber.

Development of the basin was impeded by inadequate transportation which, at first, was composed of horse and mule pack trains and ocean freighters. For many decades, the beach itself was the only road along most of the coast. In the 1860's, the "Corvallis and Yaquina Bay Military Wagon Road Company" completed a road and inaugurated a stage route from Corvallis to Elk City. From this point, 26 miles east of Yaquina Bay, travelers, freight, and mail were taken to Toledo and Newport by small boats on the Yaquina River. It was not until 1937 that a paved highway was completed along the entire coast. The Oregon and Pacific Railroad completed a line from Corvallis to Yaquina City in 1885 which hauled freight, mostly wheat to be loaded on schooners for shipment to San Francisco. By 1892, Portland had captured the Willamette Valley trade which caused the railroad to go bankrupt. Southern Pacific, subsequently, acquired it as a branch line.

Beginning in 1846 and for twenty years following, there was a series of devastating forest fires in the Coast Range and the surrounding foothills with large fires in 1846, 1849, 1854, 1857, and 1867.

Agriculture at first included several crops but later centered around the production of livestock and dairy products.

About 1855, a sub-bituminous coal mine was opened in the Yaquina Bay area and was worked for a time. Operation was curtailed when oil became available as a more economical source of heat and power.

The logging and forest products industries began in 1868 with the first sawmill on the Alsea River and grew rapidly with improved transportation, more efficient equipment, and a strong demand for lumber during World Wars I and II. During World War I, the United States Spruce Corporation built a large sawmill at Toledo and a smaller one at Kernville to manufacture aircraft stock.

Population and Economy

The population of the basin in 1960 was 36,750 or about 2 percent of the state's population. The density is 16 persons per square mile as compared to 18 for the state of Oregon.

There are three population centers in the basin. About 36 percent of the people reside along the lower reaches of the Yaquina River in and around the cities of Newport, population 5,361, and Toledo, population 3,002. Another 13 percent live in the northern end of the basin in and around the coastal tourist towns of Oceanlake, Delake, Taft, and Cutler City. The third highest population center is in and around the city of Florence, population 1,766, along the Siuslaw River. About 8 percent of the people live

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LEGEND

LAND SUITED FOR CULTIVATION AND OTHER USES

CLASS I — Soils in Class I have few limitations or hazards. Simple conservation practices are needed when cultivated. They are suited to cultivated crops, pasture, range, woodland, or wildlife.

CLASS II — Soils in Class II have moderate limitations and hazards than those in Class I. They require more difficult or complex conservation practices when cultivated. They are suited to cultivated crops, pasture, range, woodland, or wildlife.

CLASS III — Soils in Class III have greater limitations and hazards than Class II. Still more difficult or complex measures are needed when cultivated. They are suited to cultivate crops, pasture, range, woodland, or wildlife.

LAND LIMITED IN USE--GENERALLY NOT SUITED FOR CULTIVATION

CLASS VI — Soils in Class VI have severe limitations or hazards that make them generally unsuited for cultivation. They are suited largely to pasture, range, woodland, or wildlife.

CLASS VII — Soils in Class VII have very severe limitations or hazards that make them generally unsuited for cultivation. They are suited to grazing, woodland, or wildlife.

CLASS VIII — Soils and land forms in Class VIII have limitations and hazards that prevent their use for cultivated crops, pasture, range, or woodland. They may be used for recreation, wildlife, or water supply.

SUBCLASSES

e Erosion
w Wet or overflow

Drainage Basin Boundary
National Forest Boundary
Watershed Boundary

WATERSHEDS

A SALMON RIVER
B DEVILS LAKE
C SILETZ RIVER
D OTTER ROCK
E YAQUINA RIVER
F BEAVER CREEK
G ALSEA RIVER
H UPPER ALSEA RIVER
I WACONDA BEACH
J YACHATS RIVER
K FIVE RIVERS
L LAKE CREEK
M NORTH LANE COAST
N NORTH FLORENCE
O NORTH FORK SIUSLAW RIVER
P SIUSLAW RIVER
Q WILDCAT CREEK
R UPPER SIUSLAW RIVER
S DUNCAN SLOUGH
T SILTCOOS LAKE

DRAINAGE BASIN LOCATION

COUNTY LOCATION

MAP 5

GENERALIZED LAND CAPABILITY CLASSES

MIDDLE COAST DRAINAGE BASIN

OREGON

SEPTEMBER 1964

2 0 2 4 6 8 10
SCALE IN MILES

7-E-17534-N

Table 2.--Estimated acreage of land by capability class and subclass, Middle Coast Drainage Basin, Oregon, 1964 1/

Capability class	Watershed																				Total basin
	A Salmon River	B Devils Lake	C Siletz River	D Otter Rock	E Yaquina River	F Beaver Creek	G Alsea River	H Upper Alsea River	I Waconda Beach	J Yachats River	K Five Rivers	L Lake Creek	M North Lane Coast	N North Florence	O North Fork Siuslaw	P Siuslaw River	Q Wildcat Creek	R Upper Siuslaw River	S Duncan Slough	T Siltcoos Lake	
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
I	220	70	4,000	250	2,100	360	200	3,480	...	150	280	400	...	30	200	100	100	250	...	250	12,440
IIe	250	150	1,650	...	1,300	200	300	600	900	1,800	1,830	1,200	50	110	500	220	320	800	50	690	12,920
IIw	350	...	1,500	170	1,600	300	120	2,670	...	120	90	900	...	60	500	230	50	300	120	340	9,420
IIs	400	...	1,000	...	1,500	...	140	770	...	...	200	...	...	...	...	...	...	...	...	...	4,010
Total II	1,000	150	4,150	170	4,400	500	560	4,040	900	1,920	2,120	2,100	50	170	1,000	450	370	1,100	170	1,030	26,350
IIIe	100	250	950	2,940	3,000	2,320	120	320	1,300	670	530	2,240	550	160	750	1,010	1,170	8,460	60	3,130	30,030
IIIw	500	500	2,400	...	2,400	620	320	820	...	...	...	320	...	80	600	1,050	...	1,300	350	480	11,740
IIIs	100	50	1,500	...	1,300	...	100	2,000	...	...	260	80	50	10	50	50	50	1,950	20	80	7,650
Total III	700	800	4,850	2,940	6,700	2,940	540	3,140	1,300	670	790	2,640	600	250	1,400	2,110	1,220	11,710	430	3,690	49,420
IVe	600	650	2,950	3,500	2,800	5,480	750	7,040	1,650	450	890	3,240	1,050	250	940	2,020	1,430	16,570	130	5,880	58,270
IVw	150	...	300	...	300	...	100	200	...	30	30	50	...	...	...	...	...	870	...	...	2,030
Total IV	750	650	3,250	3,500	3,100	5,480	850	7,240	1,650	480	920	3,290	1,050	250	940	2,020	1,430	17,440	130	5,880	60,300
Total I-IV	2,670	1,670	16,250	6,860	16,300	9,280	2,150	17,900	3,850	3,220	4,110	8,430	1,700	700	3,540	4,680	3,120	30,500	730	10,850	148,510
VIe	14,550	13,400	44,000	8,000	32,350	5,400	10,000	29,190	1,850	6,700	16,610	29,200	10,000	2,100	7,800	18,150	7,470	40,670	1,230	9,000	307,670
VIIe	30,800	31,230	130,770	14,690	103,900	15,820	74,550	86,260	4,000	18,000	55,730	104,260	43,820	8,830	32,200	76,560	24,030	96,870	5,030	39,240	996,590
Total VI-VII	45,350	44,630	174,770	22,690	136,250	21,220	84,550	115,450	5,850	24,700	72,340	133,460	53,820	10,930	40,000	94,710	31,500	137,540	6,260	48,240	1,304,260
VIII	710	150	1,580	150	1,000	400	1,000	1,800	300	300	400	...	200	1,330	...	1,600	...	160	...	18,780	29,860
Total land area	48,730	46,450	192,600	29,700	153,550	30,900	87,700	135,150	10,000	28,200	76,850	141,890	55,720	12,960	43,540	100,990	34,620	168,200	6,990	77,870	1,482,630
Water area	470	950	2,400	200	4,850	200	3,000	350	100	280	450	2,710	30	640	460	4,010	280	900	210	6,230	28,770
Total in basin	49,200	47,400	195,000	29,900	158,400	31,100	90,700	135,500	10,100	28,500	77,300	144,600	55,800	13,600	44,000	105,000	34,900	169,100	7,200	84,100	1,511,400

1/ Compiled by USDA, Soil Conservation Service.

on farms, and the rest live in small towns or in residences scattered along the coast and interior valleys.

The economy of the Middle Coast Drainage Basin is based on four industries--forestry, recreation, agriculture, and fisheries. All of these industries are oriented to the natural resources of the basin. One measure of the importance of the various sectors of the economy is employment. Total employment in the basin in 1960 was 12,280. A breakdown of the basin's employment into the various activities is not possible; however, since 68 percent of the basin's labor force is in Lincoln County and the economic activities of the rest of the basin are similar to those in Lincoln County, employment data for this county are representative of employment in the basin.

About 39 percent of the employment in Lincoln County was attributed directly to the basic industries of forestry, agriculture, and fisheries in 1960 (table 3). The most important basic industry was forestry. Over one-fourth of the workers were engaged in logging and wood manufacturing industries. Agriculture with 3.4 percent of the total employment was the second most important basic industry. Fisheries was a close third.

Table 3.--Occupations of employed, Lincoln County, Oregon, 1960 1/

Industry group	Employment	Percentage distribution
	Number	Percent
Basic activities:		
Agriculture	283	3.4
Forestry and fisheries	182	2.2
Mining	40	0.5
Manufacturing:		
Wood products	(2,124)	(25.4)
Food and kindred products	(181)	(2.2)
Other manufacturing	(419)	(5.0)
Total manufacturing	2,724	32.6
Total basic	3,229	38.7
Tertiary activities:		
Construction	592	7.1
Transportation and communications	477	5.7
Wholesale trade	146	1.7
Retail trade	1,367	16.4
Services:		
Educational services	(440)	(5.3)
Public administration	(305)	(3.6)
Other services	(1,437)	(17.2)
Total services	2,182	26.1
Total tertiary	4,764	57.0
Industry not reporting	357	4.3
Total employment	8,350	100.0

1/ U. S. Census of Population, General Social and Economic Characteristics, PC(1)39C, Oregon.

The tertiary industries including construction, transportation, communications, trades, and services are indirectly tied to the basic industries enumerated above. Some are also tied directly to the other important industry in the area--recreation. About 57 percent of the workers in Lincoln County were employed in tertiary activities in 1960.

The forestry industry has been the most important contributor to the economic growth or decline in the coastal counties of Oregon. Agriculture, fisheries, and recreation have been important sectors of the economy for a number of years in Lincoln County, but population and economic growth were slow until the forest industry began to exploit the timber resources in the early 1920's. A large sawmill was constructed at Toledo, and population in that city trebled from 1920 to 1930 (table 4). Population in Lincoln County increased rapidly from 1930 to 1950, largely as a result of the expanding timber industry.

Table 4.--Population growth, Lincoln County, Oregon 1/

Year	Number of inhabitants					
					Lincoln County	
	Newport	Toledo	Oceanlake	Waldport	Rural farm	Total
	Number	Number	Number	Number	Number	Number
1963	5,361	3,002	1,405	715	...	22,487
1960	5,344	3,053	1,342	667	1,352	24,635
1950	3,241	2,323	700	689	2,965	21,308
1940	2,091	2,288	...	630	3,838	14,549
1930	1,530	2,137	...	367	3,024	9,903
1920	980	678	...	181	...	6,048
1910	721	541	...	...	...	5,587
1900	256	302	...	...	...	3,575

1/ U. S. Census of Population and Oregon State Board of Census.

Population continued to increase from 1950 to 1960 but at a slower rate. Lumber production during this period increased until 1954 and then dropped back to the 1950 level by 1960 (see figure 4). Since 1960, population has decreased, and unemployment has increased. As a result, in 1961 Lincoln County was declared eligible for financial assistance under the Area Development Act, and an Overall Economic Development Program was prepared. 1/ Three grants have been made including $959,590 to the Oregon State University for a marine science laboratory at Newport, $179,000 for improvements to the Port of Newport, and $50,000 for improvement of highways in Lincoln County. Several other proposals for grants are still pending.

A comparison of changes in population and migration rates for the five coastal counties in Oregon from 1950 to 1960 reveals some significant trends.

1/ Provisional Overall Economic Development Program for Lincoln County, Oregon, Lincoln Area Redevelopment Committee, November 1961.

Figure 1 illustrates the population migration rates for Lincoln and the other coastal counties. Note that the migration rates vary from a high net in-migration of 67 percent for Curry, the most southern county, to a net out-migration rate of 14 percent for Clatsop, the most northern county. Lincoln, with an in-migration rate of 2 percent, was the pivot county.

Also of significance is the age composition of the migrants. Most of the out-migrants in Clatsop and Tillamook Counties were under 24 years of age. This reflects the lack of job opportunities in the three basic industries--forestry, agriculture, and fisheries. The most significant factor has been the declining timber industry. Lumber production in Clatsop County dropped to less than half of the 1950 level in 1960 while production in Tillamook County declined somewhat less. Although some new jobs have been created due to additional tourist and recreational facilities, they have not been sufficient to sustain the population and out-migration has occurred.

In the two southern coastal counties, the majority of the in-migrants were under 44 years of age. Here again the timber industry was the most important factor. Timber harvest in these two counties doubled from 1950 to 1960. 1/

Although there was little change in total migration for Lincoln County from 1950 to 1960, there was a notable change in the age composition of the population. Note that the out-migrants were from 15 to 24 years of age while the in-migrants were 25 years or older. This reflects the changing structure of the Lincoln County and Middle Coast economy. In the past, the timber industry has been a major employer of young people entering the labor market; however, since 1950, employment in the timber industry has been decreasing, and the younger people have had to seek employment elsewhere.

With the decline of the timber industry, the Middle Coast area is exploiting its "amenity resources"--climate, coastline, and recreational opportunities which particularly influence the location of retired or semi-retired people. Data in table 5 suggest that Lincoln County has attracted more of these people than any of the other coastal counties. Note that the percentage of people age 65 or older is higher than any coastal county except Clatsop. Also, the percentage of the population in the working force is lower than any coastal county or the state.

Lincoln County is not only attracting the retired, but also the semi-retired. These people are often engaged in one of the businesses tied to recreation or tourism. The seasonal nature of these businesses is not as much of a handicap to them as it would be to someone seeking full-time business. These people usually have other sources of income and so are not totally dependent on the recreational facility for their livelihood. This at least in part explains the in-migration of older people into Lincoln County.

Also of importance to the economy of the area is the large number of "second homes" owned by people outside the basin. These homes are also

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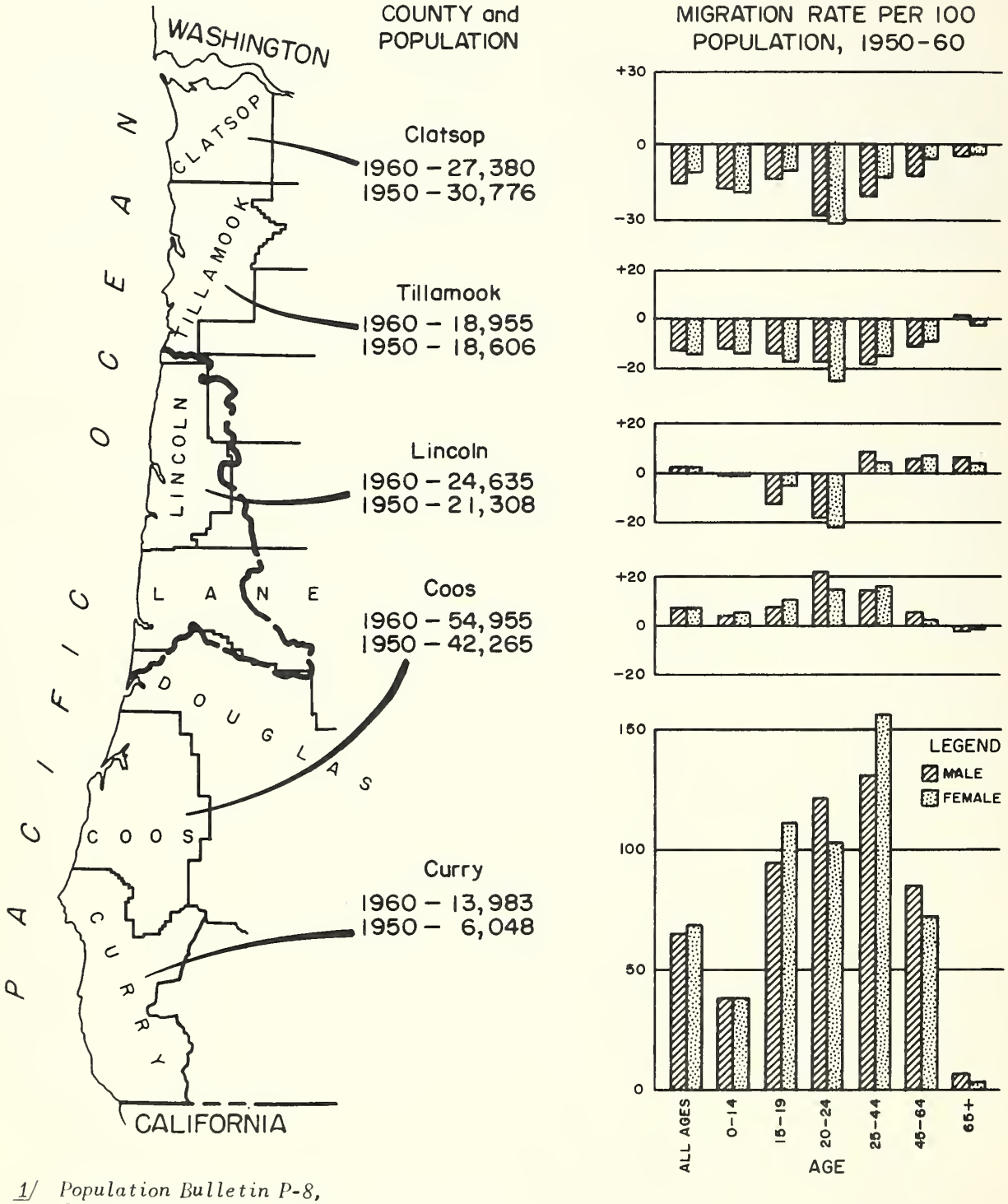
1/ Water and Related Land Resources, South Coast Drainage Basin, Oregon, USDA, February 1962.

Population migration rates by age groups, five coastal counties, Oregon, 1950-1960 1/.



1/ *Population Bulletin P-8, Oregon State Board of Census, June 1963.*

Figure 1

Table 5.--Population and labor force, Oregon coastal counties and Oregon, 1960 1/

Area	Population	Percentage of population age 65 or older	Labor force	Percentage of age 14 and older in labor force
	Number	Percent	Number	Percent
Clatsop County	27,380	13.4	11,121	55.2
Tillamook Co.	18,955	10.0	6,886	53.3
Lincoln County	24,635	12.3	8,810	50.5
Coos County	54,955	7.2	20,618	55.2
Curry County	13,983	6.1	5,622	58.8
Oregon	1,768,687	10.4	684,975	54.7

1/ U. S. Census of Population, PC(1)39B, General Population Characteristics, 1960, and Oregon State Board of Census P-10, April 1964.

maintained because of "amenity resources" of the area. In 1960, 1,421 of the 10,380 housing units in Lincoln County were held for occasional or seasonal use. In other words, about 14 percent of the houses in Lincoln County are "second homes" as compared to about 4 percent for the state of Oregon.

Owners of these homes contribute to the economy of the area in several ways. First, construction of the house contributed to employment. Second, the property increases the tax base. Third, home owners are more inclined to return more often, stay longer, and buy more supplies in the area than the occasional tourist.

Recently there has been a notable increase in construction of "second homes" and "retirement homes". Three large areas are being subdivided along the ocean front. One development at the mouth of the Alsea River includes 1,000 homes and a recreational complex. Tracts with river frontage are also being offered for sale on the larger rivers

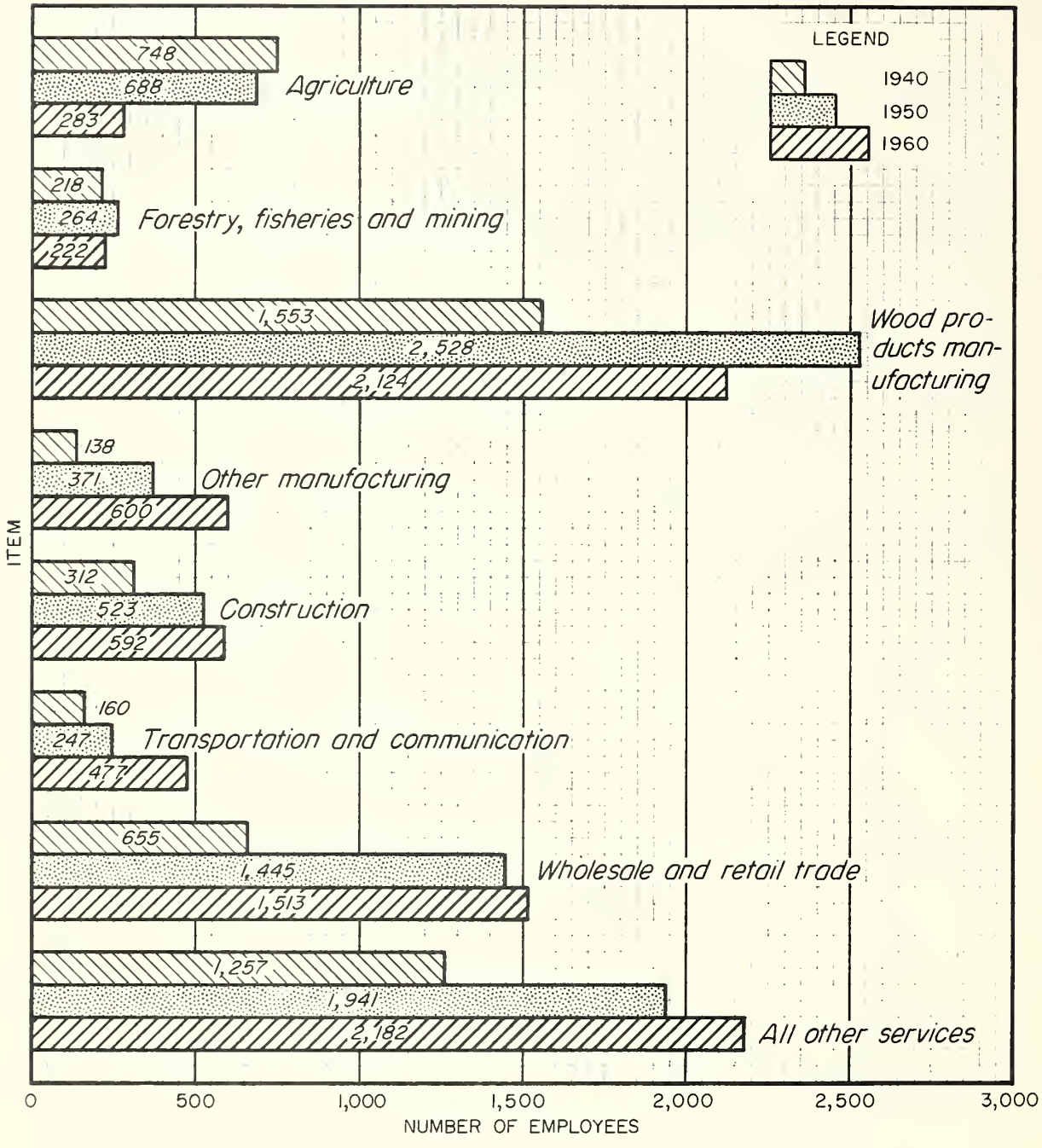
Recreation is reportedly the second most important economic activity in the basin. It was estimated that $35,624,000 was spent by tourists in Lincoln County in 1960. 1/ This figure seems grossly overestimated when compared to gross sales and income data for the county. For instance, total sales or receipts from selected services, wholesale trade, and retail trade in 1958 were $39,248,000. Value added by manufacturing was $13,822,000, and total payroll by manufacturing was $11,917,000. 2/ Total aggregate income for Lincoln County in 1959 was $43 million. 2/

Recreation is, however, becoming a more important sector of the economy. One measure of economic growth is employment; another is dollar volume of sales. Figure 2 illustrates the changes in employment in the various sectors

1/ USDA op. cit., page 22.

2/ U. S. Bureau of the Census.

Employment by industry group, Lincoln County, Oregon, 1940-50-60[1/]

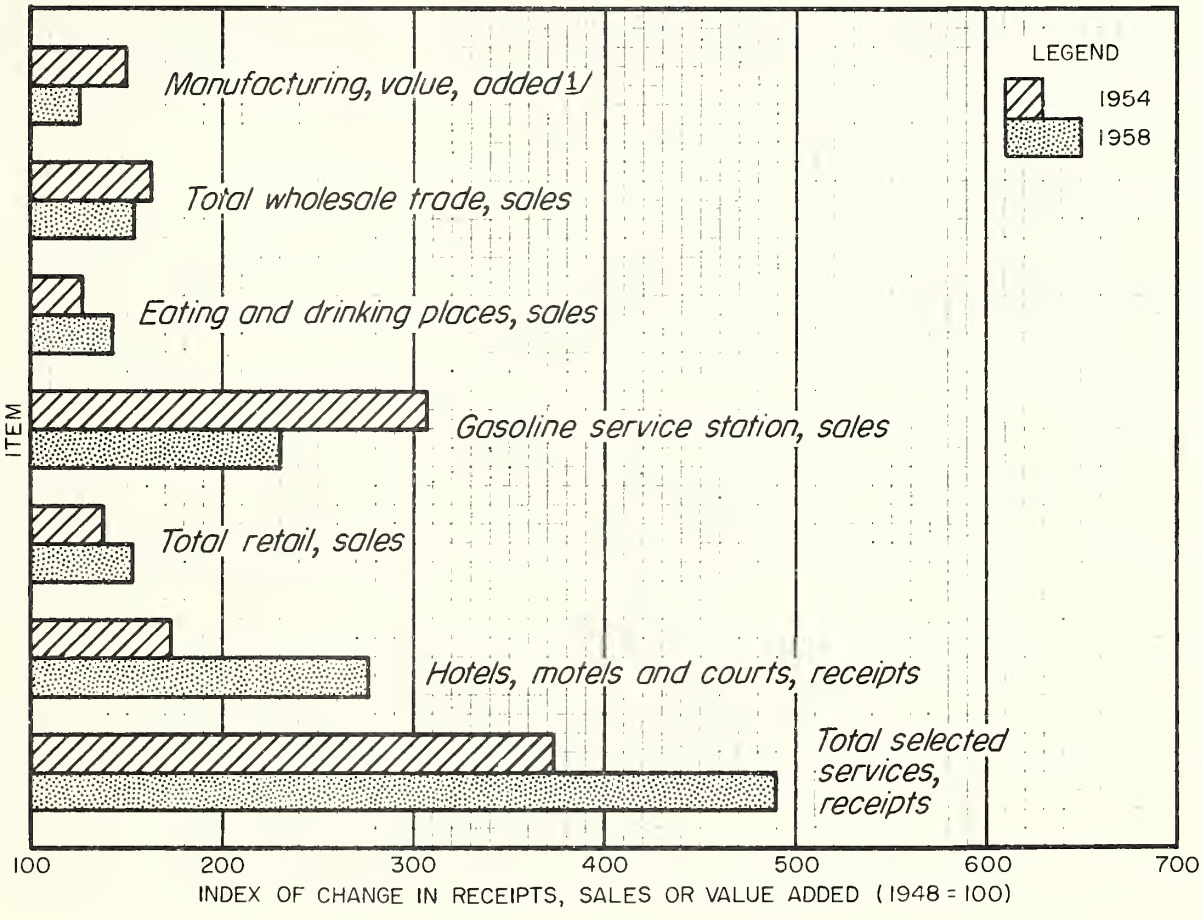


1/ *U. S. Census of Population. General Social and Economic Characteristics.*

Figure 2

of the economy in Lincoln County, and figure 3 shows the relative changes in dollar volume of sales.

Index of changes in economy, Lincoln County, Oregon, 1948-54-58 2/.



1/ *Base year 1947 rather than 1948.*
2/ *U. S. Census of Manufacture, census of retail trade, wholesale trade, and selected services.*

Figure 3

All sectors tied either directly or indirectly to recreational activities have shown steady increase in employment since 1940. On the other hand, employment in agriculture has decreased significantly; employment in forestry, fisheries, and mining has changed very little; and employment in wood products manufacturing increased from 1940 to 1950 and then decreased from 1950 to 1960.

Note the steady growth of the industry most closely tied to recreation--the services. Employment in the services increased from 1,257 in 1940 to 2,182 in 1960. Receipts from services increased by almost five times from 1948 to 1958. Receipts from hotels, motels, and courts nearly trebled during this period. Gasoline service station sales, another business tied closely to tourism, also increased significantly. Sales by eating and drinking places increased but not as much as the other services.

Indications are that recreation will continue to become more important in the economy of the basin. The biggest impact in the immediate future will be the construction of "retirement" and "second" homes. As this segment of the economy grows, competition for the land and water resources will increase.

Transportation

U. S. Highway 101 is the main north-south highway through the Middle Coast Drainage Basin generally following the coast and connecting the main towns and industrial areas. Oregon Highway 18 from Otis to McMinnville, U. S. Highway 20 from Newport to Corvallis, Oregon Highway 34 from Waldport to Corvallis, and Oregon Highways 36 and 126 from Florence to the Eugene area are the five east-west highways connecting the coast with the Willamette Valley. Secondary roads extend up most of the watersheds.

There is regular bus and freight truck service along the coast and between the valley and the coast. Two branch lines of the Southern Pacific Railroad provide freight service to portions of the basin. One connects Toledo with the valley via Corvallis, and the other from Eugene follows the Siuslaw River to the Florence area then south through the basin to Coos Bay. There is no railroad passenger service in the basin.

There is no scheduled airline service within the basin; however, there are five airports classified for public use by the Oregon State Board of Aeronautics at Florence, Newport, Toledo, Siletz, and Waconda Beach.

The only deep water harbor in the basin is Yaquina Bay where facilities are available for servicing ocean-going vessels. There are also shore facilities for servicing and moorage of sea-going fishing vessels and other small craft. The Yaquina River is maintained from Yaquina Bay to Toledo to handle lumber barge traffic. Siletz Bay, Alsea Bay, and Depoe Bay maintain facilities for fishing vessels and other small craft. Terminal facilities are available at Florence on the Siuslaw River for fishing vessels and other small craft along with docks for ocean-going barges. The Siuslaw River has capacity to handle ocean-going barges upstream to Mapleton.

Power

A very minor portion of the power used in the Middle Coast Drainage Basin is generated within the basin; however, the basin is adequately supplied with electric energy for present and future use by its integration with the Northwest Power Pool. Distribution lines provided mainly by Pacific Power and Light Company, Central Lincoln Peoples' Utility District, and Consumers Power Incorporated are adequate for the area.

Landownership

Landownership has been classified as federal, state, county and municipal, and private (table 6). Map 6 shows the location of the various ownerships.

Table 6.--Land use and ownership, Middle Coast Drainage Basin, Oregon, 1964 1/

Class of ownership	Forest	Agriculture	Other	Total
	Acres	Acres	Acres	Acres
Federal:				
National forest	418,569	...	11,920	430,489
O and C lands and Public Domain	230,727	...	3,591	234,318
State	49,201	...	...	49,201
County and municipal	2,557	...	...	2,557
Private	672,566	58,520	63,749	794,835
Total	1,373,620	58,520	79,260	1,511,400

1/ Compiled from data obtained from the Forest Service, Bureau of Land Management, and county assessors.

Almost 44 percent of the basin is federally owned. The Siuslaw National Forest accounts for approximately two-thirds of the federal land. The remainder is mainly Oregon and California Revested lands and Public Domain managed by the Bureau of Land Management of the Department of the Interior.

The state of Oregon owns three percent of the basin. Almost all of this is forest land managed by the State Forester. Over 3,500 acres, approximately seven percent, of the state land is in parks and waysides.

County and municipal ownerships account for 2,557 acres, or approximately 0.1 percent, of the basin. This land is mainly forested and is used for watershed, timber production, and recreational purposes.

Land Use

A generalized pattern of land use is presented in map 7, and land use by ownership class is tabulated in table 6.

Ninety-one percent of the basin is forest. Other uses including roads, urban areas, bays, and sand dunes predominate on 5 percent, or 79,260 acres. Three percent of the land is cropland with 15 percent of the cropland irrigated. Hay and pasture are the most important crops. The remaining one percent is used as range.

MIDDLE COAST DRAINAGE BASIN
OREGON

SEPTEMBER 1964

2 0 2 4 6 8 10
SCALE IN MILES

LEGEND

- National Forest Land
- Other Federal Land
- State Land
- County and Municipal Land
- Large Private Land
- Small Private Land
- Drainage Basin Boundary
- National Forest Boundary
- Watershed Boundary

WATERSHEDS

- A SALMON RIVER
- B DEVILS LAKE
- C SILETZ RIVER
- D OTTER ROCK
- E YAQUINA RIVER
- F BEAVER CREEK
- G ALSEA RIVER
- H UPPER ALSEA RIVER
- I WACONDA BEACH
- J YACHATS RIVER
- K FIVE RIVERS
- L LAKE CREEK
- M NORTH LANE COAST
- N NORTH FLORENCE
- O NORTH FORK SIUSLAW RIVER
- P SIUSLAW RIVER
- Q WILDCAT CREEK
- R UPPER SIUSLAW RIVER
- S DUNCAN SLOUGH
- T SILTCOOS LAKE

Middle Coast Drainage Basin

DRAINAGE BASIN LOCATION

TILLAMOOK, YAMHILL, POLK, LINCOLN, BENTON, LANE, DOUGLAS

COUNTY LOCATION

MAP 6
LAND STATUS MAP
MIDDLE COAST DRAINAGE BASIN
OREGON

SEPTEMBER 1964

2 0 2 4 6 8 10
SCALE IN MILES

7-E-17534-N

NORTH COAST BASIN

OCEAN

PACIFIC

LEGEND

- Forest
- Agricultural
- Sand Dunes
- Land Use Boundary
- Drainage Basin Boundary
- National Forest Boundary

DRAINAGE BASIN LOCATION

Middle Coast Drainage Basin

COUNTY LOCATION

YAMHILL, POLK, LINCOLN, BENTON, LANE, DOUGLAS

MAP 7

GENERALIZED LAND USE

MIDDLE COAST DRAINAGE BASIN

OREGON

SEPTEMBER 1964

SCALE IN MILES

7-E-17534-N

RECREATION RESOURCES IN THE BASIN

RECREATION OPPORTUNITIES

There are many recreational opportunities in this basin, but the major activities are associated with the ocean beaches. Another important recreational area is the tidewater portion of the main streams, where many recreational residences are located. Fishing and big game hunting are the major recreational pursuits in the interior of the basin.

Shoreline

The shoreline is a complex of wide sandy beaches and bluff or rock areas. The beaches are generally sandy and frequently are in the form of spits partially enclosing interior bays at river mouths. Except for a few bold rock headlands, there is a sand or sand and gravel beach fronting the entire shore.

The beach in the southern portion of the basin consists of the Florence dune sheet. This dune area is considered to be nationally significant and is included in current National Seashore legislation.

Dune Area. The dune area, which extends from the south boundary of the basin to Sea Lion Point, varies in width from 1/4 to 3 miles. This area of constantly moving sand has spectacular scenery and continually changing topography (photo 2). There are many fresh water lakes which vary in size from 3,200 acres to only a few acres. Most of the larger lakes were originally streams flowing from the mountains to the sea and were formed as advancing dunes dammed the rivers (photo 3). Other lakes were formed when the advancing dunes moved broadside against a regular stretch of mountain front, forming linear depressions which now contain long narrow lakes. The lakes are a big factor in the high quality of the recreation resource because of their scenic qualities and because their warmer water makes them more popular with swimmers than the nearby ocean. Boaters, too, enjoy them. Fishermen find them to be among the most productive lakes in the state.

Another outstanding feature of this area is the beauty of the portion that is vegetated. The typical cover is an overstory of Douglas-fir, Sitka spruce, western hemlock, and shore pine. Under this is a very dense evergreen cover of salal, coast huckleberry, wax myrtle, and rhododendron. Other areas support beachgrass, manzanita, willow, salt marsh grasses, wild strawberry, and yellow sand verbena. The vegetation is beautiful during any season of the year, particularly in May and June when the rhododendrons are in bloom.

Photo 2.--The dune area has spectacular scenery and continually changing topography. FS photo. NO. 498649

Photo 3.--Cleawox Lake was formed when moving sand blocked the outlet of a stream. Siuslaw N. F. photo. NO. 1

Northern Shoreline. The shoreline in the northern two-thirds of the basin is much more rugged, with several rock headlands dropping straight into the ocean. Between these rugged outcrops are beautiful sandy beaches of varying sizes (photo 4). Some of the beaches are only tiny indentions between projecting bluffs while others extend for several miles and are quite wide, gently sloping, smooth, sandy stretches that invite the beachcomber or sunbather. Other beaches, such as Agate Beach near the mouth of the Yaquina River, are very rocky, actually covered with pebbles instead of the more common sand. Many varieties of agates are found in these areas.

Photo 4.--The small pebbly beach at Devils Elbow State Park is typical of the beaches found between rocky headlands in the central portion of the shoreline. RBSP photo NO. 7-1572-6

The northern shoreline area also provides the rock fishermen with the locale for his sport. Many people fish for cod, kelp fish, bass, and perch from rocks along this rugged stretch of coast (photo 5). Other fishermen try their luck from the jetties protecting the harbors. These people hope to catch sea bass, sea trout, herring, or ling cod.

Tidewater

The tidewater area, which extends several miles inland on the major streams, generally has narrow valleys with flat bottom lands. The main attraction in this area is fishing and water sports with many people building vacation and retirement homes along the streambanks.

Photo 5.--Rocky projections such as Cooks Chasm are popular with rock fishermen. FS photo NO. 455815

Even in the shoreline portions of the major streams, fishing and boating take precedence over other forms of recreation use. Every bay has a sports fishing "fleet" and charter boats to provide ocean fishing for the more adventurous (photo 6).

Interior

The interior of the basin is devoted to forests with a few scattered farms. The recreational opportunities in this area are generally confined to fishing and big game hunting and the more passive activities of sightseeing and picnicking. Recreation developments consist of a few roadside areas on the main roads and primitive camp areas along some of the smaller streams away from the main roads.

The only exception to this is the recreational residence area around Triangle Lake in Lane County. This 240-acre lake is a popular resort area for residents of the Eugene-Springfield area. In addition to the private residences, there are some commercial establishments which cater to the vacationing public. The lake offers year-round fishing and active water sports during the summer.

TRENDS IN USE

Recreation use figures which are available for this area show heavy use in the coastal strip with the majority of the users concentrated in the dunes

Photo 6.--A portion of the Depoe Bay Fishing Fleet at dock awaiting arrival of the salmon runs. RBSP photo. NO. 7-1572-10

area. Because of the relatively mild weather, interspersed with dramatic winter storms along the coast, year-round use occurs. However, the main surge is during the normal vacation period between Memorial Day and Labor Day.

Of the 658,000 people who visited Siuslaw National Forest recreation areas in the basin during 1963, over 510,000 were primarily interested in (1) sightseeing, (2) fishing, (3) picnicking, and (4) camping. It is estimated that 50 percent of the national forest visits were to the dune area in 1963 (photo 7). If the Forest Service retains management of their present area, they anticipate an eightfold increase between 1963 and 2000 in recreation use. Even with the establishment of the proposed National Park Service managed National Seashore Recreation Area, the Siuslaw National Forest expects a fourfold increase in recreation visits to the remaining national forest recreation sites.

BLM campgrounds in the interior have also shown increases in use. This is partially the result of increased facilities and better access.

Lane County recreation data for 1963 indicate that 51 percent, or almost 840,000, of the recreation visits to county maintained areas occurred in the coastal portion. This is an increase of 75 percent over 10 years ago.

Attendance at state parks has increased from 3.3 million in 1958 to 3.8 million in 1963. During this same period overnight use almost doubled..

Photo 7.--Boating and fishing are popular pastimes on the warm-water lakes found in the dune area. Siuslaw N. F. photo NO. 2

The popularity of beach areas is no accident. Coastal areas provide the opportunity for many active and passive pleasures from skindiving to bird watching. Because of the very nature of the Middle Coast Drainage Basin, the recreation opportunities available at any beach or shoreline in the world are available here with one possible exception. The surf temperature is not conducive to swimming.

"Shorelines afford easy, active forms of recreation. Going into the surf is fun whether one swims or not. It isn't necessary to be a mountain climber to take walks along the beach, and beachcombing is an activity that appeals to everyone from toddler to octogenarian." 1/

Not all sections of the shoreline can expect equal use as has been shown by existing use data. Those areas with wide sandy beaches are the most popular in present patterns of outdoor recreation. 2/ Here the land and water are readily accessible. The safety of the warm sand is only a step away from the violent activity of the pounding surf. The stimulation of the foreign

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1/ Shoreline Recreation Resources of the United States, ORRC Report No. 4, page 4.

2/ Ibid., page 4.

environment of the water and the relaxation of sun bathing are nowhere else so closely associated. Physical sport and mental relaxation are equally available.

The summary of forecast which was made by the Outdoor Recreation Resources Review Commission is considered to be as pertinent to this portion of the Oregon coast as it is to the nation's shorelines in general.

"The year 2000 will probably see a major increase in demand for recreational shoreline of all types to such an extent that in areas of metropolitan impact, 1/ most of the shoreline will be needed to satisfy the recreational demand, and some of it will have to be managed with much greater efficiency than at present (photo 8).

Photo 8.--Because of increased demand for shoreline recreation, all values need to be considered before developing shoreline areas to assure use that returns the greatest public benefits. RBSP photo. NO. 7-1571-3

"Shoreline which is further from metropolitan centers will receive increasing pressure for recreation use, although this pressure will not be as intense as that which is closer. Some of this shoreline has great value as superior natural environment or wildlife habitat. Other portions of it are valuable for superior recreation areas. All of these values need to be con-

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1/ Within a two-hour drive of a large population center.

sidered on their various merits, in the light of the necessity to assure shoreline use that returns the greatest public benefits." 1/

RECREATION FACILITIES

The public recreation facilities available in this basin are as varied as the recreation opportunities. Overnight camping areas offer everything from carry-your-own-water to hot showers; rustle-your-own-firewood to electric hot plates; furnish-your-own-candle to electric outlets for trailer lights. The more modern and convenient camps are now operated on a user charge basis while the primitive do-it-yourself camps are free.

Existing Facilities

A tabulation of public facilities by managing agency is shown in table 7. All agencies have had an active program of recreation expansion in the recent years.

Table 7.--Existing recreation facilities, Middle Coast Drainage Basin, Oregon, 1963 1/

Managing agency	Camping units		Picnic 2/ Areas	View-points 2/	Boat launch 3/
	Tent	Trailer		Number	Sites
Federal:					
Forest Service	191	120	10	5	5
Bureau of Land Management	35	28	17	...	1
State	538	169	20	15	2
County and municipal	2	18	10	1	12

1/ Forest Service, Bureau of Land Management, Oregon State Highway Department, and Lane County Recreation Department.

2/ Some areas are tabulated in both categories if picnicking is available at a viewpoint.

3/ Includes both paved ramps and log ways for river launching of drift boats.

Because of the increased use, the Forest Service has made a concerted effort to provide approved water supplies and modern sanitation facilities at the recreation sites along the coast. During 1963, four modern comfort stations were constructed at recreation sites in the basin, and a new water system was installed at Cape Perpetua.

1/ Op. cit., page 40.

Proposed Development

At the present time, there are several proposals for recreation development for this portion of the Oregon coast. The public agencies have programs, some originating over 30 years ago and revised periodically, for recreation development. Among the present proposals are several to establish a National Seashore area of varying size.

Dune Area. In the event that a National Seashore is established, the recreation development will generally follow the plans made by the present agencies. These plans have been formulated over a long period and provide for anticipated future use. The establishment of a National Seashore area managed by either the Forest Service or National Park Service could increase the future use of the area even above that forecast.

Photo 9.--Small, warm-water lakes and shifting sands are the major attractions in the dune area. FS photo NO. 498661

Because of the many proposals, it is not possible to accurately forecast the future development in the dune area except to say that facilities will be provided to the extent possible by whoever is charged with the management of this extremely valuable recreation resource.

In the event that management of the Proposed National Seashore remains with the same agencies as at present, the Forest Service has plans to provide 23 additional camp and picnic grounds, 11 swimming areas, and 5 boat launching ramps on the land within the Siuslaw National Forest.

In 1965, the Bureau of Land Management will build a six-mile road across the sand dunes to the south jetty of the Siuslaw River. Four miles

of this road will run parallel to and about a thousand feet east of the Pacific Ocean.

Other Areas. There are not so many proposals for recreation development in the remaining portions of the basin, but the managing agencies have plans for expansion of the recreation facilities.

Lane County is concentrating on developing fishermen-centered picnic and boat launching sites along the Siuslaw and its major tributaries. Several sites for "putting in" drift boats are being considered. These developments are not paved launching ramps but merely an improved spot to slide drift boats down to the river or to pull them out by means of a hand-operated winch. The sites of this type are proving popular with fishermen.

In addition to the river access for fishermen, both Lincoln and Lane Counties are considering developing beach access in the northern shoreline areas. These areas would provide easier access to the beach for beachcombing, rock hunting, bathing, and general enjoyment.

Several of the cities along the northern Lincoln County beach area also plan to provide beach access and parking areas.

The state of Oregon has four areas within the basin presently included in its long-range development plans for state park development. These include development of beach access and bathhouses at two sites near Newport; acquisition of an area for a state park at Triangle Lake to provide water-centered activity between Eugene and the coast; and development of beach access, picnicking, and possibly overnight facilities at Carl M. Washburne State Park north of Florence. 1/

The Bureau of Land Management is planning to develop several areas scattered throughout the interior area. All of the proposals are in conjunction with some type of water activity, be it only streamside scenery or a developed swimming area. It has identified at least 12 areas that have potential as campgrounds and picnic grounds, three areas on the Siletz River as drift boat access points and one Resource Conservation Area. The Resource Conservation Area will be located on the Siuslaw River between Austa and Alma. It is proposed to have small rest areas along the Siuslaw River Road at viewpoints where rustic signs will explain the conservation practices observed in the distance.

The Bureau of Land Management is also making recreation sites available for development by local government agencies. One such instance is a boat-launching area being developed by the town of Siletz. Other sites are being made available to Lincoln and Lane Counties.

In the next 35 years, the Forest Service plans to develop recreation facilities on approximately 2,400 acres of the Siuslaw National Forest outside of the proposed national seashore area. Approximately 80 percent of the proposed development will be within the Middle Coast Drainage Basin.

1/ Oregon Outdoor Recreation, pages 101 and 118.

The plans allow for a variety of interests and uses. Included in the proposal are: 120 camp and picnic grounds with over 5,000 family units; 12 swimming areas; 3 additional observation points; and at least 3 more boat-launching areas.

In addition to the developments mentioned, a visitor information center in the Cape Perpetua Recreation Area is being considered. This proposed center would provide for interpretation of the natural and cultural items observed on the distant landscape.

Almost all of the proposed additional recreational facilities will be located close to water. Several of the smaller sites will be located in the interior, but generally the larger, more fully developed sites will be located in the shoreline or tidewater areas.

WILDLIFE RESOURCES

The wildlife resource provides a significant portion of the recreational attraction of the basin. The wildlife and game fish resources of the state are managed by the Oregon State Game Commission while the commercial, or food, fishery is managed by the Fish Commission of Oregon. Habitat conditions, which have a marked influence upon the size of wildlife and fish populations, are controlled by landowners.

Big Game

Black-tailed deer are the most numerous and popular big game animal in the basin. The deer population has been increasing because timber harvest has created more favorable habitat conditions. Hunting pressure is variable depending on accessibility. It is estimated that 5,600 deer were harvested during 1962; approximately 40 percent were bucks taken during the regular season.

A portion of the coastal elk herd is found in the basin. According to the Game Commission, the Roosevelt elk population has increased during the past few years. Approximately 85 elk were harvested in the basin during the 1962 hunting seasons. The 1962 harvest was down slightly due mainly to inaccessibility caused by the Columbus Day windstorm.

Hunting pressure will probably continue to increase in the future. Although some private land is closed to hunting, most commercial timber companies recognize the need for an adequate harvest of big game and maintenance of good public relations. They have been encouraging hunters to hunt on their tree farms. As access to both public and private land is improved, hunting pressure will tend to become more uniform. Even with improved hunter distribution, the hunters will continue to hunt the recent clearcuts because they do not like the dense ground cover found in uncut or old clearcut areas.

Other Game

Various species of small game and other big game are found throughout the basin. When compared with deer hunting, very few people hunt for these

animals. Only 30 trappers were active in Lincoln County during the 1962-63 trapping season.

Predators

Predators are also scatterd throughout the basin. The 1962-63 predator control report by the Fish and Wildlife Service indicates that raccoon, bobcat, and bear are the most common predators in the basin; during the period five mountain lions were taken by federal trappers in Lincoln County.

Anadromous Fish

All of the major streams in the basin have runs of anadromous fish. The Salmon River probably has the poorest reputation for steelhead fishing success. Part of this can be attributed to the large percentage of novice anglers who fish this stream. The Siletz River has a good reputation as a stream for drift fishing, but even then the average fishermen spent 18 hours on the stream for each steelhead landed.

Photo 10.--Free flowing streams of clear water, such as this stretch of the upper Siletz River, are necessary for propagation of anadromous fish. RBSP photo. NO. 7-1541-12

The increase in steelhead and silver salmon fishing on the Alsea River can be attributed to the success of the North Fork Alsea and Fall Creek Hatcheries. With the improved fishing has come increased problems of limited access and day use facilities. Some thought has been given to providing access on a fee basis across private lands. Several of the public agencies

have plans for increased access, "put-in" points, and day use facilities but are limited by a lack of finances.

The Game Commission reports that salmon fishing in all streams in the basin was good to excellent during 1961-62. This can be attributed in part to the large run of silver salmon which entered the rivers during a freshet in early October 1961.

In order to assure the continuation of the anadromous fishery, studies are being conducted to determine the relationship of embryo survival to conditions in the spawning gravel. The study, which is being conducted as a part of the Alsea Watershed Study, is in its fourth year of a prelogging period. Characteristics of salmon spawning areas will provide basic information prior to changes expected from timber harvesting in the future.

The anadromous fishery resource is extremely important to this basin. Every effort should be made by all land managers to protect and improve spawning areas and fish access on all streams. Several of the major landowners are cooperating in removal of debris jams which have been restricting passage of anadromous fish.

Resident Fish

"Resident fish management as distinguished from the management of migratory fish, such as salmon and steelhead, involves the development of trout and warm-water game fish angling opportunities." 1/

All species of game fish common to the state are found in the lakes and streams of the basin. The lakes in the dune area are famous for warm-water fishing. The fishing pressure is heavy enough on the major streams and lakes that the Game Commission has a schedule for restocking with hatchery-raised fish.

In other areas, such as Woahink Lake, efforts are being made to encourage natural reproduction. Observations following the distribution of gravel on certain shoals indicated that some areas were being used by Kokanee for egg deposition.

WATER NEEDS

There are many kinds of water requirements, both consumptive and nonconsumptive, related to recreation. In the past, recreational use has developed most in the vicinity of water. The forecasted trends indicate that this will continue on an even larger scale. The ocean has an attraction for a very large segment of the population. The quiet, sheltered lakes found in the sand dune area are also very attractive. Every flowing stream has its beauty spots, its fishing spots, and its swimming holes which are favored by people in search of various forms of recreation.

1/ OSGC Biennial Report, 1961-62.

It is difficult, probably impossible, to determine the amount of water needed for recreation. But it is evident from the number of people who utilize the water-centered recreation resource that this is a major beneficial use of water in this basin.

Wildlife

Water requirements for wildlife include the following:

1. Water consumed.
2. Water required as environment for wildlife such as waterfowl and some furbearers. Fairly uniform water levels must be maintained for some species, and the water must be kept free of pollution.

Wildlife water needs are expected to remain reasonably stable.

Fish Life

There are certain water quality requirements pertaining to temperature, oxygen content, and freedom from pollution and turbidity which must be maintained if fish and the aquatic plants and animals they use for food are to thrive. An important part of maintaining water quality is providing adequate streamflows and lake levels. When water levels are low, especially during summer months, the water temperature increases, oxygen level decreases, and pollution increases because wastes are not carried away promptly. Flow depths must be adequate and stream channels open so that fish can travel to the spawning areas. Water and streambed conditions in the spawning areas must be suitable for each species.

FOREST LAND MANAGEMENT IN THE BASIN

CHARACTERISTICS OF FORESTED AREAS

The forests, which cover 91 percent of the basin, are composed mainly of Douglas-fir, western hemlock, Sitka spruce, western red cedar, and red alder. Douglas-fir is the principal species, followed closely by hemlock and spruce (photo 11). Much of the scenic attraction of the coast area is provided by stands of shore pine and Sitka spruce which have been uniquely deformed by the wind.

Photo 11.--Douglas-fir sawtimber is the principal commercial timber species of the Middle Coast Drainage Basin. RBSP photo. NO. 7-1571-12

Forest Landownership

Fifty-one percent, or 701,054 acres, of the forest land is publicly owned. Sixty percent of the publicly owned land is in the Siuslaw National Forest located mainly in the southern half of the basin. Thirty-three per-

cent is Public Domain and revested Oregon and California railroad lands administered by the Bureau of Land Management and located chiefly in the eastern portion of the basin. State forest lands are scattered throughout the basin but account for only seven percent of the publicly owned forest land.

Approximately 49 percent of the forest land is privately owned. About 78 percent of this is owned by large private owners and is managed on various continuous production bases.

Forest Land Use

The major uses of forest land in the Middle Coast Drainage Basin are for commercial timber, water production, and outdoor recreation. Other important uses include wildlife habitat and botanical and ecological study. Much of the private forest land, especially that in large ownerships, is managed intensively for timber production. Most federal and state forest land is managed to accommodate a balance of several uses. Some is used primarily for outdoor recreation with livestock grazing and timber harvesting modified or excluded.

There is considerable variation in forest land management. On some private holdings, the only management is that related to the harvest of merchantable timber, while on other private holdings, close attention is given to measures that increase productive capacity of the land. On public land used intensively for outdoor recreation, such as state parks, the management objective is to provide adequate facilities and a safe and aesthetically pleasing environment.

National forest land is managed under the "multiple use-sustained yield" concept. As defined by the Multiple Use and Sustained Yield Act of June 1960 (P. L. 86-517), this means the management of forest and related areas in a manner that will conserve the basic land resource itself while at the same time producing high level sustained yields of outdoor recreation, range, timber, watershed, and wildlife and fish in the combination that will best meet the needs of the nation. By law, the majority of the Bureau of Land Management lands are devoted to perpetual forest production in conformity with the principle of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating streamflow, contributing to economic stability of local communities and industries, and providing recreational facilities. BLM's management program of "balanced use" is similar in scope to the Forest Service's "multiple use" program.

Recently there has been rapid expansion in the multipurpose use of forest land, particularly in relation to timber management and outdoor recreation. The major resources of forest land in the basin--water, timber, recreation, wildlife, and forage--are discussed elsewhere in this report.

Land Class and Cover Type Classification. Land class and cover type classification for the Middle Coast Drainage Basin is shown in table 8. This classification is based primarily on the Forest Service system of four classes which are commercial forest, noncommercial forest, reserved forest, and nonforest.

Table 8.--Forest area and timber volumes by stand-age class and ownership class, Middle Coast Drainage Basin, Oregon, 1964 1/

Ownership	Conifers: over 90 years	Conifers: under 90 years	Hardwoods: over 90 years	Hardwoods: under 90 years	Nonstocked	Reserved	Total
	Acres	Acres	Acres	Acres	Acres	Acres	Acres
National forest	318,584	63,733	8,948	19,887	6,977	440	418,569
Other federal	93,415	105,535	...2/	11,177 2/	20,600	...	230,727
State of Oregon	11,359	24,514	...	10,241	...	3,087	49,201
County and municipal	...	920	...	705	40	892	2,557
Small private	10,980	35,375	18,071	60,110	24,600	...	149,136
Large private	174,405	262,293	10,950	73,761	2,021	...	523,430
Total	608,743	492,370	37,969	175,881	54,238	4,419	1,373,620
	MMBF	MMBF	MMBF	MMBF	MMBF	MMBF	MMBF
National forest	18,680	2,435	72	20	...	25	21,232
Other federal	5,890	1,003	...2/	50 2/	...	...	6,943
State of Oregon	415	176	...	10	...	...3/	601
County and municipal	...	...3/	...3/	...3/	...	...3/	...3/
Small private	551	203	186	146	...	...	1,086
Large private	14,187	3,002	134	162	...	...	17,485
Total	39,723	6,819	392	388	...	25	47,347

1/ PNWF&RES Forest Survey, BLM, State Forestry Department, and River Basin Survey Party estimates. All data adjusted to basin by USDA River Basin Survey Party.

2/ Breakdown by age class not available.

3/ Data not available.

Commercial forest land is forest land that is (a) producing, or is physically capable of producing, usable crops of wood, (b) economically available now, or prospectively, for timber harvest, and (c) not withdrawn from timber harvest. Commercial forest land is further subdivided by cover types.

Noncommercial forest land is forest land that is physically incapable of producing usable crops of wood because of adverse site conditions, or is so physically inaccessible as to be economically unavailable for timber harvesting within the foreseeable future.

Reserved forest land is forest land, either productive or nonproductive with regard to timber growth potential, that is withdrawn from timber harvest through statute, ordinance, or administrative order.

Nonforest land includes all land that is not at least ten percent stocked with trees (except for nonstocked cutover forest land) such as cultivated land, range, dunes, cities and towns, lakes, and streams.

PROTECTION OF FOREST RESOURCES

Protection from Fire

Fire protection for forest resources in the Middle Coast Drainage Basin is shared by the Federal Government, the State of Oregon, and rural fire protection districts. Generally, the Forest Service protects land within the Siuslaw National Forest; the State of Oregon protects land outside the Siuslaw National Forest and within one-eighth mile of forest land; and the rural districts protect land and wooded area adjacent to the towns.

Photo 12.--Big Creek drainage from Blodgett Peak in 1943. FS photo. NO. 428327

The major causes of fire on the Siuslaw National Forest are campfires, smokers, logging, and in 1963--lightning. There were eight lightning fires on the Middle Coast portion of the Siuslaw National Forest in 1963. This compares with one lightning fire in 1962 and none in the previous three years.

The several fire protection agencies within the basin are concentrating on reducing the incidence of man-caused fires. An example is documented by the Siuslaw National Forest's 1961 fire report narrative. "A material reduction from 14 to 7 along the coastal strip should be largely credited to increased prevention efforts there. Approximately 60 workdays, equally divided between two men, were financed for public prevention contacts from Waldport to North Bend.

"A general upward trend in man-caused fires ties closely to increased use, tourists, recreationists, and a steady expansion in both summer and permanent coastal populations. A continued and increasing future effort in prevention cannot be avoided."

Photo 13.--Big Creek drainage from Blodgett Peak in 1964, showing growth of planted trees when protected from wildfire. RBSP photo. NO. 7-1571-6

Protection from Insect, Disease, and Animal Damage

Protection of the forests of the Middle Coast Drainage Basin from insect, disease, and animal damage is primarily the responsibility of the individual landowners and managers. However, many owners join together in combatting forest pest problems. Their cooperative efforts are coordinated by the Northwest Pest Action Council, an organization of public and private land managers. The Forest Service makes forest insect and disease detection surveys and provides funds for pest control on all forest lands under the Cooperative Pest Control Act. The State of Oregon and private landowners share in financing pest control projects on private land.

Important forest insect pests in the basin include the Douglas-fir beetle, the balsam woolly aphid, the Sitka spruce weevil, and the spruce budworm, all of which have reached epidemic numbers in past years. Insect pest populations are presently at an endemic level, killing an occasional weakened tree. Total losses from insects are, however, quite large. Control of forest insects lies primarily in keeping forest stands in a vigorous condition. This includes prompt disposal of logging slash and windblown or fire killed timber which may provide a breeding place for insects, and prompt suppression of epidemic outbreaks of insect populations.

As a result of the Columbus Day storm in 1962, there were many areas where extensive blowdown occurred (photo 14). Every effort was made to remove this material from the forests by 1964 to avoid a Douglas-fir beetle epidemic. Because chemical control of this beetle is not feasible, the only means to keep infestations at a safe level is to rely on natural enemies and a healthy, vigorous forest.

Photo 14.--Blowdown resulting from the Columbus Day storm was very heavy in the basin. Siuslaw N. F. photo NO. 3

There are several important diseases of forest trees in the basin. They range from various root rots which cause windthrow losses to several fungous rots which cause decay in the commercial portions of the trees. Because a healthy and vigorous forest is the best defense against these various diseases, the importance of forest sanitation cannot be overlooked. Forest sanitation can be defined as the act of removing trees killed or injured by fire, insects, fungi, or other harmful agencies, for the purpose of preventing the

spread of insects or disease. 1/

Several species of small animals feed on tree seed and seedlings and must be controlled when they threaten the establishment of forest stands.

In several areas within the basin, particularly in the Drift Creek drainage near the town of Harlan, deer damage to fir reproduction is heavy. The deer repeatedly browse some young trees until they resemble a cabbage plant (photo 15). In these trees, the terminal buds are continually removed and lateral branches are stimulated to grow vertically. If and when the deer are controlled, the tree usually will recover and resume normal growth habits. Many systems have been tried, but no effective, economical method has yet been found to control deer damage.

Photo 15.--The tree on the right has been repeatedly browsed by deer; the trees on the left are normal five-year-old seedlings. Siuslaw N. F. photo NO. 4

1/ Forestry Terminology, Society of American Foresters, Third Edition, 1958.

TIMBER

Approximately 1,373,620 acres of the basin are classed as forest land and contain 46.9 billion board feet of softwood timber (table 8). 1/

This basin contains some of the best timber growing sites in the state. The portion of Lane County that lies in the basin has been described by the 1957 Forest Survey Report 131, covering Lane County's forest resources, as being mainly site class II with most of the remainder rated as class I. These ratings are based on a five-site classification designed to judge an area's ability to produce timber, in which class I is the most productive. Similar sites are found in Lincoln County, but the average for the basin may only be a high site class III.

It is claimed that Sitka spruce stands cut for airplane manufacture in World War I from the Siletz River area averaged 150,000 board feet per acre.

Logging and Wood-Using Industries

Logging began with the arrival of the first settler, and in approximately 1868, the first sawmills were built. One mill was built on Yaquina Bay and shipped lumber to San Francisco. Another mill was built in the same year on the South Fork of the Alsea River just north of the Lane County line. The total production from this mill was used locally.

The industry accelerated during and after World War I when Sitka spruce was in demand for airplanes. Much of the spruce was rafted to Astoria for sawing although one mill was built at Kernville for this purpose.

In recent years, timber harvest has again exceeded lumber production in Lincoln County (figure 4). Large volumes of logs are transported out of the county for processing in the Willamette Valley.

The number of sawmills increased from seven in Lincoln and Tillamook Counties in 1926 to 58 in Lincoln County in 1952. By 1960, this had been reduced to 15 operating and three idle sawmills. As of 1963, there were 22 sawmills, 6 plywood and veneer plants, and 1 pulp and paper mill in the Middle Coast Drainage Basin (photo 16). The total installed mill capacity exceeds one billion board feet per year.

Sawmills and plywood plants produce large quantities of wood residue that can be used in the manufacture of wood fiber products. A study of Mill Residues in Three Oregon Counties by S. E. Corder and D. R. Gedney in 1955 indicated that the unused coarse residue (chippable wood) from the mills in Lincoln County alone could supply 69 tons of sulphite process pulp per day. Unused coarse residue from Douglas-fir lumber production could support a pulp production of 172 tons per day.

1/ Timber volumes used in this report are in terms of log scale, Scribner rule, in trees 11" and larger in diameter 4-1/2 feet above the ground.

Timber harvest and lumber production, Lincoln County area 1/, 1926-1960.

1/ *Lumber production 1926-1940 and 1942 Lincoln and Tillamook Counties, 1941 Lincoln, Curry, and Tillamook Counties.*

Figure 4

Photo 16.--The logs stored in the foreground can be processed into one of several products by this integrated timber processing plant at Toledo. RBSP photo NO. 7-1541-3

In order for this residue to be utilized, several factors have to be considered, not all of which are subject to the control of an individual producer or even the entire industry. These factors include:

1. Suitability of available wood for known products. Not all of the residue is suitable for presently known products.
2. Markets for fiber products. Plant capacity for some products is already over expanded nationally.
3. Relative costs of raw material, labor, transportation, etc., compared to costs in other areas.
4. Relative cost of disposal of industrial wastes.
5. Availability of sufficient quantities of good water.

Harvesting and Regeneration Practices

Harvesting practices have changed greatly over the years. In the early days of logging in the basin, Douglas-fir was the king, and clearcutting was the method. A logger would start at one edge of an ownership and work his way to the other. If a forest fire burned out the operation, he would move to another area and start again. The general pattern was for whole drainages to be logged at one time, leaving the lower valued species to be destroyed by wildfire or wind storms.

A system of scattered clearcuts has now evolved. The most common harvesting practice on public lands is the establishment of clearcut units of approximately 40 acres surrounded by green timber which provides a seed source and breaks the continuity of highly flammable logging slash. All

Photo 17.--Felled and bucked timber ready to be yarded to the landing at the top of the hill. Much of this timber was blown down by the Columbus Day storm. RBSP photo NO. 1571-11

species of sawlog size have a market at the present time. Even the so called worthless alder is marketable when the trees are large enough.

Cable logging systems are now generally used on the steep ground in the Coast Range. Tractors are used on more gentle ground; however, on some areas, old tractor logging roads, stacked one on top of the other like steps, are still visible on the hillsides.

In the days before the development of adequate highways and powerful trucks, the logs were transported to the sawmill by railroad or raft. Log rafts are still moored or towed in the estuaries of the larger streams. Millions of board feet of spruce were rafted from the Siletz River to Astoria for milling. Other rafts from the Siuslaw River went north and south along the coast.

As soon as possible after logging, the slash is burned under controlled conditions. This is done to reduce the hazard of a wildfire and to facilitate reforestation by reducing the brush competition. The Forest Service personnel in the Siuslaw National Forest have pioneered in summer burning of Douglas-fir logging slash.

Photo 18.--Trucks are the most important means of transporting logs in the basin. These logs are being dumped into Valsetz Lake. RBSP photo. NO. 7-1553-4

Photo 19.--Slash burning under controlled conditions reduces the danger from wildfire and reduces brush competion to planted and natural seedlings. Siuslaw N. F. photo. NO. 5

By burning when the slash and weather conditions are favorable, the yearly accumulation of slash can be disposed of between April and October, but most generally between June and September (table 9).

Table 9.--Slash disposal by month of burning, Siuslaw National Forest, 1954-1963 1/

Year	April	May	June	July	August	September	October-November
	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1954	95	124	26	192	68	345	215
1955	65	340	135	477	238	585	264
1956	66	520	180	185	361	385	675
1957	380	123	246	1,190	208	404	146
1958	312	448	671	446	744	305	...
1959	1,303	...	707	1,271	268	1,279	...
1960	...	...	2,464	874	348	1,289	739
1961	...	...	1,567	676	561	1,454	150
1962	...	...	2,495	773	789	1,113	103
1963	...	1,457	1,286	366	773	587	523
Total	2,221	3,012	9,777	6,470	4,358	7,746	2,815

1/ Siuslaw National Forest.

This system usually requires completely putting out all fire on the burned areas and frequent patrol for a period of time thereafter. During the last ten years, the system has proved effective and extremely successful.

In the fall and winter following slash burning, the clearcuts are either planted with two-year-old Douglas-fir seedlings or seeded with Douglas-fir seed by helicopter. Hemlock and spruce are seldom planted because they will seed from nearby trees quite satisfactorily if the area is not invaded by brush. If planting is delayed past the first winter, a jungle of brush and hardwood species is likely to take over the site. This brush jungle is composed of various combinations of salal, salmonberry, red alder, vine maple, ocean spray, bracken fern, and several species of blackberries. After a timber site is captured by brush, the area has to be sprayed to allow the more valuable conifers to reproduce and develop; or a timber crop from the site will be delayed for several years until the conifers can become established in the brush and grow through the canopy. A brush invasion may lengthen the period between commercial harvests by 40 years. The economic importance of reforestation cannot be overlooked. The growth rate on average conifer timber land in the basin can be expected to exceed 800 board feet per year. When Douglas-fir stumpage is selling for $30 to $40 per thousand board feet, a landowner is losing at least $25 to $30 per acre per year when his forest land is not producing a commercial crop.

Most young timber stands need intensive cultural treatment to improve the quality and quantity of wood growth. This can be achieved by thinning young stands to remove dying, damaged, and overcrowded trees to give remaining

trees more growing space. Public and private owners have been doing limited amounts of thinning in stands over 50 years old on gentle terrain; however, little thinning has been done in stands less than 50 years old or stands on terrain too steep for skidding with horses or small tractors. Improved markets for small logs and development of equipment and techniques for thinning on steep terrain would help to improve the economic feasibility of thinning. Young-growth management research will play a vital role in the development of forest management in this basin.

Sustained Yield Potential

The determination of the annual sustained yield potential for the forested areas is basic to the forecasting of forest industry development in the basin. Because of the fire history in the past 120 years, old-growth timber is quite rare (photo 20). Almost all of the commercial timber is less than 100 years old. This basin has been utilizing young-growth timber for a number of years, but because of the forest site conditions, large sawtimber (over 21") is not uncommon.

Photo 20.--Large old-growth trees are becoming scarce in the basin. This old-growth spruce had to be trimmed in order to get through a bridge on the way to the mill. Siuslaw N. F. photo NO. 6

Natural growth conditions are important in the calculation of annual sustained yield potential, but several additional factors need to be considered. The following items were considered in these calculations for the Middle Coast Drainage Basin:

1. The average site quality of the forest land.
2. Promptness and adequacy of regeneration of forest land.
3. Adequacy of protection from fire, insect, disease, and animal damage.
4. Cultural treatment applied to forest land.
5. Maintenance of growth and stocking throughout the life of the stand.
6. The age at which the final harvest is made.
7. Availability of markets for wood that is not presently merchantable.
8. The amount of forest land that is converted to and from forest land.
9. Taxation policies.

After making several assumptions for these items, the potential annual sustained yield of softwood timber was estimated to be 764.6 million board feet per year.

GRAZING

There are approximately 37,000 acres of grazed forest land in the basin. This is predominately private land in the stream bottoms near existing farms. It consists of land that varies from relatively open to completely stocked forest stands. The slopes vary from gentle to steep except in areas with intermixed cropland where the gentler slopes were cleared for cropland leaving the steeper slopes in forest. The forage is generally of low quality, mostly brush, but with some good pasture in small opening in the bottoms.

Approximately 350 head of cattle and 350 head of sheep are grazed on the Siuslaw National Forest. The grazing permit areas are near the stream bottoms in natural meadows and old fields. As timber reproduction invades these areas, range improvement measures will be required to sustain grazing use.

WATER

Watershed management, with its associated problems and opportunities for enhancement of the water resource, is discussed in the Water Related Problems, Needs, and Opportunities chapter of this report.

Water Requirements on Forest Land

Few quantitative estimates have been made of the many consumptive and nonconsumptive water requirements on forest land. The largest single consumptive use is for plant growth, but the evaop-transpiration process is seldom measured so the actual amount used is not known. The following estimates of certain consumptive water requirements on the Siuslaw National Forest are presented as a sample of the water needed for occupancy and management of forest land. Even though these requirements are small, they are important and should be considered in planning the development and use of water resources in the basin.

Consumptive use	Amount (million gallons)
Domestic:	
Administrative sites	1.9
Recreation areas	5.5
Livestock - permitted grazing	0.2

Domestic. Domestic water uses in relation to forest land include the following:

1. Water used at field administrative stations of both public agencies and private companies.
2. Water used at public recreation sites and at recreation facilities such as summer homes, organization camps, and resorts.
3. Water required for domestic purposes by other forest users including loggers, roadbuilders, and local residents while working or living in forested areas.

Water requirements for all these uses are expected to increase as forest areas are used more heavily and managed more intensively. Domestic use for recreation can be expected to increase at the greatest rate. An eightfold increase in recreation visits to this basin is expected in the next 40 years. Water use for recreation areas can be expected to increase at an even greater rate because of the emphasis upon installation of improved water systems and flush toilets in camping and picnic areas.

Recreation. Domestic water use for recreation has been mentioned. Other water requirements are generally nonconsumptive and include habitat for fish and water for boating, swimming, and aesthetic enjoyment.

This use is expected to increase greatly. Any water development should make provision for recreation use which is now a recognized benefit under the provisions of P. L. 566 and other federal water development laws.

Livestock. Livestock water needs on the Siuslaw National Forest as well as other forested areas in the basin are expected to remain stable.

Industrial. Industrial water requirements on forest land are confined mainly to that required for construction and maintenance of forest access roads and the water used for storage and transportation of logs.

The consumption of water for access road construction and maintenance will probably continue at its present rate until such time as the primary access road system is completed; it is then expected to decrease considerably. Materials other than water will probably be used for dust abatement in the future, reducing water requirements.

Log storage and transportation water needs are expected to remain fairly stable.

Fire Control. Variable quantities of water are required for control of forest and slash disposal fires. Water must be readily available when

Photo 21.--Peeler blocks are transported from the cut-off saw to the plywood plant by the current of the Siuslaw River. Poppino photo NO. 1

needed, but it is not anticipated that much will have to be stored to meet these needs in this basin. No great change is seen for this water requirement in the future.

Resource Management

A resource manager, whether he is a logging superintendent, a farmer, a forest ranger, or a tree farmer, deals with all the resources of the drainage, but his primary aim should be to utilize them in such a way that optimum quantities of clear, usable water are achieved. Watersheds in this basin convert large amounts of rain and some snow to streamflow. For example, in places where 72 inches of precipitation annually reach the soil, a plot only ten feet square receives and disposes of 18.75 tons of water each year. It is essential that the manager include control of erosion in his plan of management and that he think of water and soil as resources of value like trees and forage.

Roads. Improperly built or maintained roads can be a major source of silt in streams; but well designed, built, and maintained roads will have a relatively minor adverse effect on the watershed. Some points to be considered when building roads are listed below:

1. Plan the road system in advance of construction.
2. Learn to recognize and avoid trouble spots.
3. Avoid sustained steep grades.
4. Provide adequate drainage.

5. Keep roads and fills out of streams.
6. Build with minimum earth movement.
7. Keep roads in good repair.
8. Revegetate disturbed areas such as cuts, fills, and borrow areas.

A particularly critical point in relation to roadbuilding is found in the vicinity of the "headwall" of the streams of the steep drainages of this basin. This is the area of almost perpendicular slopes at the extreme head of a stream. When this area is disturbed by roadbuilding or logging, a slump or "sluice-out" is almost bound to follow (photo 22). The debris from slumps has been known to scour a stream from the headwall area to the wide valley bottom several miles downstream.

Photo 22.--Slumps or land slides frequently occur after the headwall portion of a stream is disturbed by roadbuilding. RBSP photo NO. 7-1571-10

Logging. Erosion from logging can be diminished by improving skidding practices and by rehabilitating trouble spots afterward. Logging methods and equipment use can play a tremendous part in damaging or preserving water quality. The following points should be considered before logging an area:

1. Do not yard logs in or across streams (photo 23).
2. Keep skid trails drained by directing the water into areas where the sediment can settle out.
3. Use tractors only on moderate slopes; uphill cable systems are preferred on slopes over 30 percent.
4. Areas with high erosion hazards should be revegetated as soon as possible.

Photo 23.--Yarding logs through streams should be avoided. Poppino photo NO. 2

Controlled Burning. To reduce fire hazards and as a tool of forest management, controlled burning can be practiced under some conditions; however, some protective cover is always removed, and chances for erosion are increased. Erosion can be kept under control if a few precautions are used.

1. Controlled burning should be carefully supervised by competent foresters.
2. Slash burning should be closely correlated with weather conditions. Summer slash fires should be mopped up and then patrolled to prevent hold-over fires from breaking out later.
3. If fire killed timber must be salvaged, precautions against erosion should be intensified, not relaxed.

Grazing. Grazing, like timber harvest and controlled burning, is an acceptable watershed practice only if soil disturbance can be minimized. The following principles should be applied to grazed portions of the basin.

1. Forage should be moderately grazed.
2. Livestock should be kept off the area when it is soft from excessive moisture.

In addition to control of grazing by domestic livestock, control of wildlife numbers through game and habitat management is required to maintain proper wildlife and habitat conditions and to protect soil and water values.

These recommended measures for roadbuilding, logging, burning, and grazing are aimed at prevention and control of damage to the water and soil resources. Where they can be applied to the needs of each individual watershed, erosion can be kept within acceptable limits. The need for costly remedial measures in the future will be virtually eliminated. 1/

Domestic and Municipal Water

A large portion of the water used in individual homes and by municipalities comes from forested watersheds. Eleven small watersheds which provide water for use by several towns and suburban water districts are located in the Siuslaw National Forest. These watersheds are managed to provide reasonably uniform flows of high quality water. In addition to providing water, other uses are permitted including timber production and hunting.

There are also numerous individual water developments on both public and private forest land. In some drainages, almost every small stream provides water for at least one home. Thirty-nine individual water systems were covered by special-use permits on the Waldport Ranger District in 1961.

As a result of the widespread use of small streams as a source of domestic water, timber sale foresters check the cutting areas carefully to be sure that no water system will be damaged as a result of timber harvest.

The Forest Service policy for municipal watershed management provides for timber harvesting in areas and by methods which will provide rapid regeneration and minimum disturbance so as to enhance the watershed while harvesting the timber.

1/ The basic information for this section was obtained from "Managing Forests to Control Soil Erosion", Dunford and Weitzman, Water, 1955 Yearbook of Agriculture. USDA 1955.

AGRICULTURE IN THE BASIN

LAND USE FOR AGRICULTURE

Agriculture in the Middle Coast Drainage Basin revolves around the production of forage for livestock. The land base for agriculture consists of 37,000 acres of grazed forest land, 15,480 acres of rangeland, and 42,850 acres of cropland (table 10). Only 6.4 percent of the land in the basin is used for agricultural purposes.

Table 10.--Agricultural land use, Middle Coast Drainage Basin, Oregon, 1964 1/

Agricultural land use	Acreage
	Acres
Grazing land:	
Forest	37,000
Range	15,480
Total	52,480
Cropland:	
Dryland:	
Pasture, hay, and silage	34,430
Other	1,100
Total	35,530
Irrigated:	
Pasture, hay, and silage	4,120
Other	180
Total	4,300
Cropland not harvested or pastured	3,020
Total cropland	42,850

1/ Based on USDA River Basin Survey Party data and U. S. Census of Agriculture data.

The 52,480 acres of rangeland and grazed forest land is utilized by sheep, beef cattle, and goats. Rangeland is defined as noncropland pasture, and grazed forest land is defined as land grazed by livestock that is at least 10 percent stocked with trees. The rangeland consists of cleared areas which have been improved for grazing by slashing, burning, and seeding to perennial

grasses or mixtures of grasses and legumes. The grazed forest land usually consists of cutover areas of brush or timber adjacent to agricultural lands.

About 2.9 percent of the land in the basin, or 42,850 acres, is cropland. Pasture, hay, and silage are the most extensively grown crops, occupying 90 percent of the cropland and providing the major feed base for the dairy and livestock farms. The cropland is located on the valley floors adjacent to major streams (see map 7). Much of this land is presently limited to the production of pasture or forage crops because of flooding and drainage problems.

Photo 24.--One of the larger tracts of cropland pasture in the Siletz watershed. RBSP photo. NO. 7-1571-1

Hay is harvested from about a third of the cropland acreage, and about 2 percent is harvested for silage.

Forage yields vary in the basin depending upon such factors as soils, plant type, drainage, flooding, growing season, rainfall, irrigation, and management practices. The only readily available source of information on yields is the U. S. Census of Agriculture which reported an average yield of 1.5 tons per acre for all harvested hayland in Lincoln County in 1959. The average yield for hay silage was 9.4 tons per harvested acre. These yields do not, however, reflect total forage production because in many cases the acreage harvested for hay and silage is also pastured.

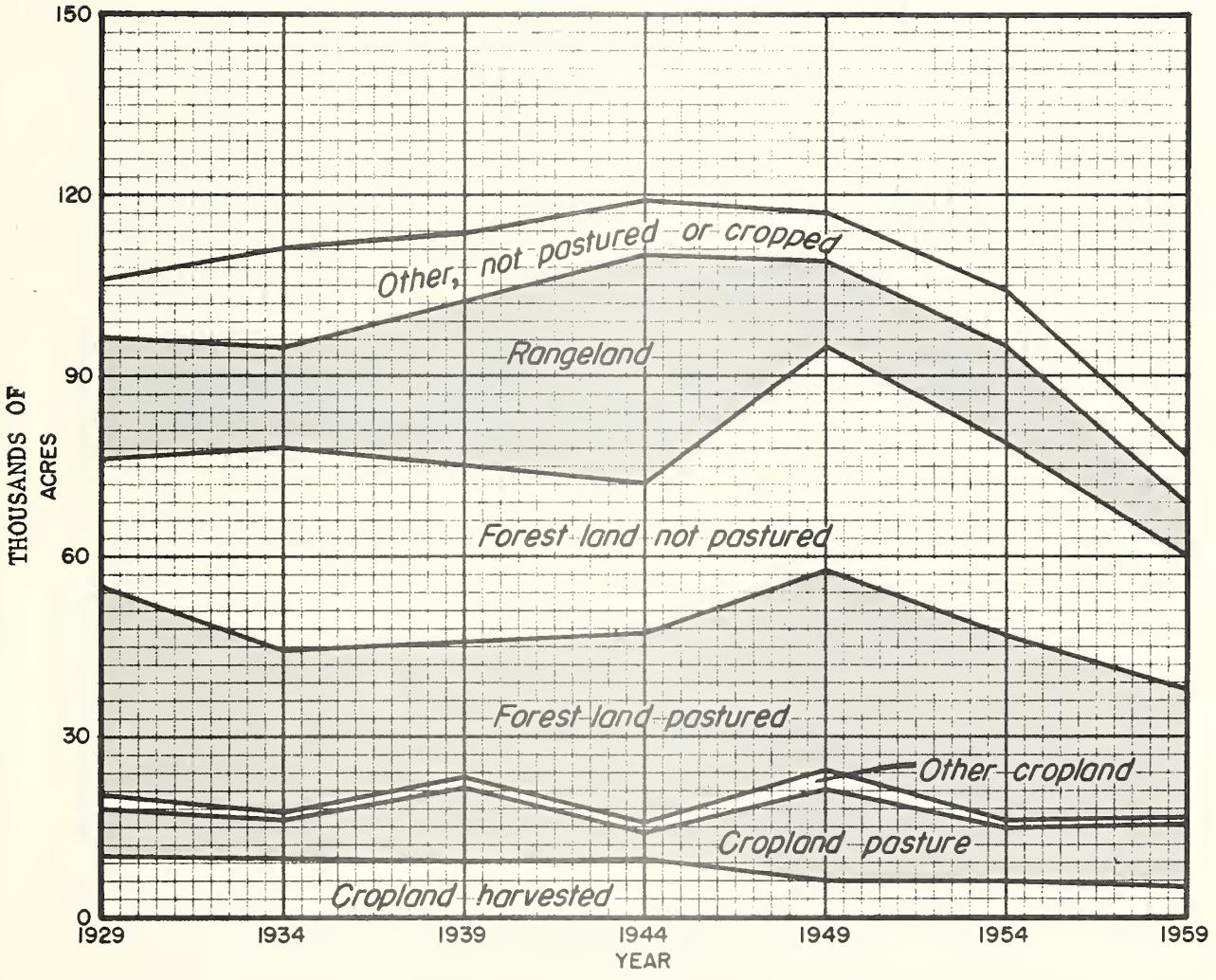
Census data show no appreciable differences in hay yields on irrigated

and nonirrigated land for the years 1954 and 1959. Any increase in yields due to irrigation is apparently reflected in pasture.

Small acreages of small grain, fruits, vegetables, flowers, and bulbs are raised in the basin, but none are major sources of agricultural income. For instance, 304 farms in Lincoln County grew vegetables in 1959, but only 11 farms reported any sales.

Trends in agricultural land use for Lincoln County are illustrated in figure 5. Total acreage in farms increased from 1929 to 1944 but has steadily decreased since 1944. Most of the land going out of agriculture was forested. This land has in most cases been bought by timber companies. Cropland acreage has fluctuated, but no trend is apparent. Harvested acreage has been decreasing while pasture acreage has increased.

Farmland use, Lincoln County, Oregon, 1929-1959.1/



1/ *U. S. Census of Agriculture.*

Figure 5

The acreage cut for hay has been decreasing since 1934, but no trend is evidenced in average yields per acre (table 11). One of the reasons for the

Table 11.--Hay and hay silage acreage and production, Lincoln County, Oregon, 1934-59 1/

Year	Hay			Hay silage		
	Acreage	Production	Yield per acre	Acreage	Production	Yield per acre
	Acres	Tons	Tons	Acres	Tons	Tons
1934	8,917	12,818	1.44	...	...	...
1939	8,024	12,433	1.55	...	...	...
1944	8,664	13,522	1.56	...	...	...
1949	6,255	9,128	1.46	39	145	3.7
1954	5,684	7,580	1.33	681	3,724	5.5
1959	4,573	6,918	1.51	236	2,222	9.4

1/ U. S. Census of Agriculture.

decrease in hay production is the shift from dairy animals to beef. Hay requirements for wintering beef cows are less than for milk-producing dairy cows. There has also been a corresponding decrease in feed purchased from outside the area. Lincoln County farmers spent $630,247 for feed for livestock and poultry in 1954 and $399,390 in 1959.

Silage production has increased significantly since 1949. Silage has several advantages over hay in this area. Harvesting and drying of hay are often hampered by late, wet springs; storage for winter use is also costly. Wet weather is not as much of a problem in harvesting silage, and storage costs are lower.

CHARACTERISTICS OF AGRICULTURE

Number and Size of Farm

With the exception of the larger dairy farms and some of the livestock ranches, farming in the basin is a part-time endeavor. It is estimated that of the 1,060 farms in the basin, no more than a fourth of the operators are solely dependent upon income from farming. In 1959, only 46 percent of the Lincoln County farms were commercial operations; the others were part-time or part-retirement farms. 1/ However, about half of the commercial farmers

1/ Commercial farms are defined in the census report as farms with a value of sales of $2,500 or more. Part-time farms are farms with a value of sales of farm products of $50 to $2,499 and operators under 65 years of age who either worked off the farm 100 days or more or had other income from nonfarm sources that was greater than the total value of farm products sold. Farms with a value of sales of farm products of $50 to $2,499 were classified as part-retirement if the farm operator was 65 years old or older.

also had off-farm jobs. In total, 65 percent of the farmers worked off their farms, and 73 percent of the farm families had income from other sources that exceeded the income from their farms.

Most of the part-time farmers work as loggers or in one of the jobs related to the forest industry. The small acreages are used to produce products for their own consumption or as a supplemental source of income.

Other "farmers" are simply retired people who raise a few products for their own use and sell any surplus for additional income.

A comparison of some indicators of farm size for Lincoln County and Oregon is presented in table 12. Note that the average acreage of cropland

Table 12.--Farm size: Average acres, value of land and buildings, and value of farm products sold, Lincoln County and Oregon, 1959 1/

Item	Unit	Lincoln County	Oregon
Average acres:			
Land per farm	Acres	154	499
Cropland per farm	do.	33	126
Value of land and buildings:			
Per farm	Dollars	21,802	41,160
Per acre	do.	150	93
Value of farm products sold:			
Per farm	Dollars	3,757	9,678

1/ U. S. Census of Agriculture.

per farm in Lincoln County is about a fourth of the average for the state. Although the average value of land and buildings per farm in Lincoln County is about half of the value for the state, the value per acre is higher. This reflects the high ratio of buildings per unit of land in Lincoln County. The value of farm products per farm was $3,757 as compared to $9,678 for Oregon.

Part-time farming in the basin is not new. Historically, agriculture has been largely a marginal or part-time endeavor. Many of the farms acquired by homesteading in the late 1800's were in reality timber claims. As lumber mills were established in the area, opportunities for off-farm employment became available. Because of the seasonal and cyclical nature of the lumber industry, people coming into the area to work in the woods and mills also sought small acreages to be used for subsistence in periods of unemployment. Thus, the number of farms continued to increase until the 1940's, and the pattern of part-time farming was established (table 13). By 1934, almost half of the farmers worked off their farms. Since 1944, the percentage of farmers working off their farms has increased while the

number of farms has decreased. The average size of farms has increased somewhat, but part-time farming still prevails.

Table 13.--Number of farms, average size of farms, and percentage of farmers working off farm, Lincoln County, Oregon, 1929-59 1/

Year	Number of farms	Average size of farms	Acres of cropland per farm	Percentage of farmers working off their farms
	Number	Acres	Acres	Percent
1929	732	126	28	...
1934	840	113	21	48
1939	972	114	24	47
1944	963	125	16	52
1949	856	137	30	70
1954	677	156	24	58
1959	504	154	33	65

1/ U. S. Census of Agriculture.

Tenure

Most of the farmers in the basin own their farms. Census data for Lincoln County indicate the 81 percent of the farmers owned all the land in their farms; 12 percent were part owners; and 7 percent were tenants.

Livestock

The basin's agricultural land base provides forage for 17,100 cattle, 11,400 sheep, 2,700 goats, and a few hundred horses (table 14). The 4,880 milk cows in the basin provided about 37 percent of the agricultural income in 1959. Most of the dairy farms are located on the better soils of the valley floors. Beef cattle, the second most important source of income, are also raised on the valley pastures. Sheep and goats are well adapted to the rangeland and forested grazing land.

The large number of part-time farmers in Lincoln County is reflected in herd sizes. In 1959, 65 percent of all cow herds and 88 percent of the milk cow herds consisted of nine or fewer cows.

One problem confronting livestock growers in the basin is internal parasites in livestock. Climatic conditions are especially favorable for parasites in the coast areas, and large annual losses are reported to occur.

The trends in livestock numbers are illustrated in figure 6. Numbers of beef cattle have increased; horses, goats, and milk cows have decreased; and sheep have fluctuated widely with no apparent trend. Milk cow numbers have decreased steadily since 1945. This decline is consistent with the national trend and is associated with several factors. The decline in consumption of dairy products per capita and the rapid rise in milk production per cow are two of the most important. Adjustments to these conditions have

been achieved through a reduction of milk cows and dairy farms. In 1944, there were 4,412 milk cows and 238 dairy farms in Lincoln County. By 1959, the number of milk cows had dropped to 1,933, and the number of dairy farms had decreased to 115. At the same time, annual milk production decreased from 17.2 million to 16.5 million pounds. Thus, milk cow numbers decreased by 56 percent, dairy farms by 60 percent, and milk production by only 4 percent.

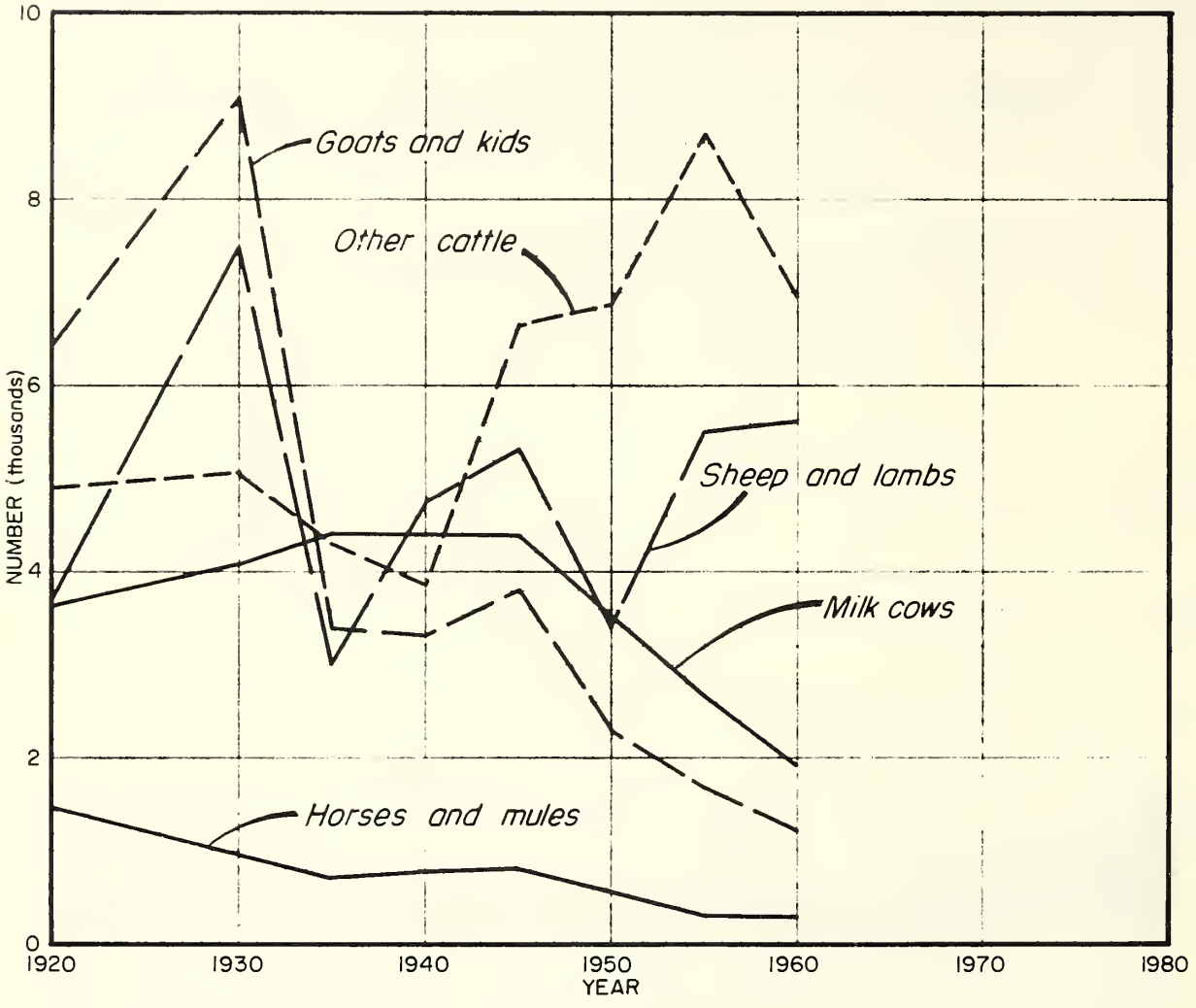
Table 14.--Livestock numbers, Middle Coast Drainage Basin, Oregon, 1959 1/

Type of livestock	Total
	Number
Milk cows	4,880
Beef cows	3,970
Bulls and calves	8,250
Total cattle	17,100
Sheep and lambs	11,400
Goats and kids	2,700

1/ Compiled from data from the USDA River Basin Survey Party and the U. S. Census of Agriculture.

Photo 25. Dairy cows, the most important source of income in the basin, grazing on a typical valley bottom pasture. RBSP photo NO. 7-1571-2

Livestock, Lincoln County, Oregon, 1920-1960 1/



1/ *U. S. Census of Agriculture.*

Figure 6

Milk cows are being replaced by beef cattle as reflected by the upward trend in number of "other cattle" in figure 6. One of the reasons that beef cattle have increased is because they are well adapted to the part-time operations that prevail in the basin. Beef operations require less time and investment than dairy farms, and the economies of scale are not as important.

Goats, used in the past for removing brush, have become less numerous in recent years. Horses, no longer needed for power, are also decreasing in number.

Agricultural Income

Gross farm income from the basin was about $3.7 million in 1959 (table 15). Livestock products accounted for 74 percent of the income, forest products from farms accounted for 18 percent, and crops accounted for only 8 percent.

Table 15.--Estimated farm income, Middle Coast Drainage Basin, Oregon, 1959 1/

Commodity sold	Gross income	Percentage distribution
	Thousand dollars	Percent
Livestock sold:		
Dairy products	1,350	37
Cattle and calves	1,027	28
Poultry products	180	5
Other livestock products	163	4
Total	2,720	74
Crops sold	286	8
Forest products sold	650	18
Total farm products	3,656	100

1/ Based on data from the U. S. Census of Agriculture and data from the USDA River Basin Survey Party.

Dairy products are still the most important source of income, but receipts from other livestock products (primarily beef) are rapidly increasing while receipts from dairy products have remained fairly stable since 1945 (figure 7). Although milk production has decreased since 1945, income from the sale of dairy products has remained about the same because the lower production was offset by higher prices for milk. Income from the sale of "other livestock products" has increased because of both higher beef production and higher prices for beef.

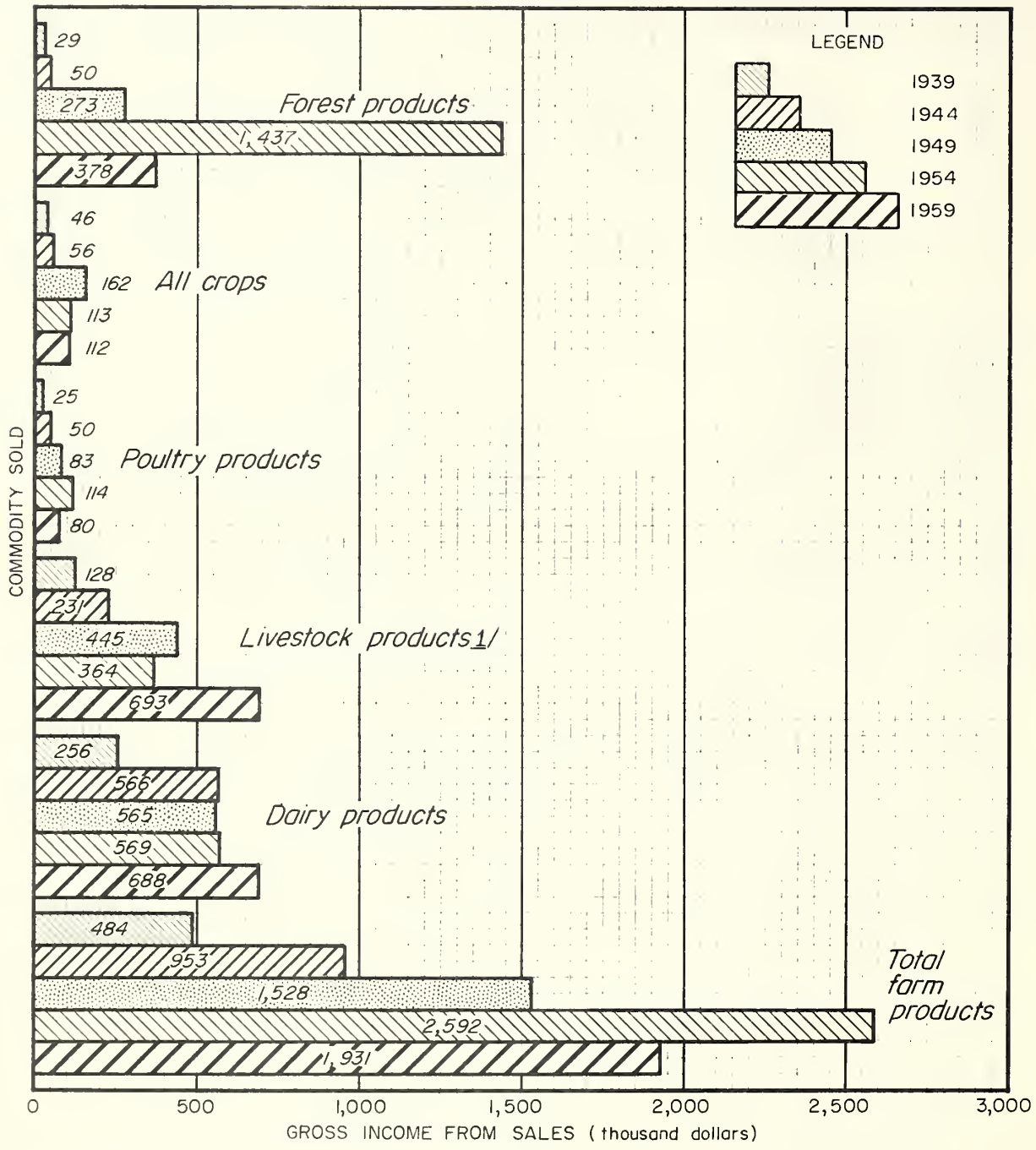
Income from the sale of poultry products has increased but is still a minor part of the total farm income. Receipts from crops increased from 1939 to 1949 but has decreased since.

Receipts from the sale of forest products by farmers vary widely from year to year. For instance, in 1954, over half of the farm income in Lincoln County was from the sale of forest products. In 1959, farm income from forest products sales dropped back to about a fourth of what it was in 1954.

Marketing

Marketing of agricultural products in the basin has been a problem in the past because of remoteness from major population centers and inadequate

Gross income from sale of farm products by commodities, Lincoln County, Oregon, 1939 - 1959[2/].



1/ Other than poultry and dairy products.

2/ U. S. Census of Agriculture.

Figure 7

transportation facilities. The development of modern highways in recent years has improved the marketing situation, but the cost of shipping farm supplies in and farm products out continues to be a significant expense to the producer.

A limited amount of milk is sold as whole milk in the area, but the majority is processed by local creameries and shipped out of the basin.

Most of the livestock is marketed in Portland. Other agricultural products are sold primarily for local consumption and are marketed by the growers.

IRRIGATION

Irrigated acreage in the basin varies from year to year depending on moisture conditions, pasture conditions, and needs for forage. It is estimated that of the 6,420 acres developed for irrigation in the basin, about 58 percent of the irrigated acreage was used for pasture only; 38 percent was cut for hay or silage; and 4 percent was for other crops.

Natural streamflows are the source of water for 98 percent of the land developed for irrigation; small ponds and reservoirs provide water for the rest (table 16).

Table 16.--Water source, irrigation method, and water rights, Middle Coast Drainage Basin, Oregon, 1964 1/

Item	Acreage developed for irrigation
	Acres
Water source:	
Streamflow	6,300
Reservoir	120
Total	6,420
Method of application:	
Sprinkler	6,285
Gravity	135
Total	6,420
Water rights 2/	7,003

1/ USDA River Basin Survey Party data.
2/ Oregon State Water Resources Board.

Sprinkler systems are almost universally used for applying irrigation water in the basin. They have proved to be better adapted to the area than flooding systems for several reasons. Since surface drainage is a problem,

water control is an important factor, and the amount and distribution of water is better regulated by sprinkler than by flooding. Another factor favoring sprinkler systems is that the water supply is generally in large rivers with small gradients which makes gravity diversion difficult. Since most of the land is adjacent to the streams and not in large blocks, pumping is more practical than gravity diversion. Overflow on irrigated land during flood stages creates a maintenance problem on ditches, diversions, and other structures associated with flood irrigation systems. It is also difficult to keep fields level enough for flood irrigation where overflow occurs. In addition, sprinkler systems facilitate the control and efficient use of water by part-time farmers who of necessity cannot be present to make the frequent water changes required by flood irrigation.

Irrigation development to date has been accomplished on an individual farm basis. Most of the irrigable land is in small blocks adjacent to the streams, and group facilities have not been necessary.

Although total water rights for irrigation in the basin exceed the acreage developed for irrigation, the irrigated acreage in some of the tributary areas is larger than the water rights and farmers are being urged to file for rights.

Irrigation in the basin is a relatively recent practice and has not progressed in this area to the degree that it has in some of the other coastal areas. Although the acreage irrigated fluctuates widely from year to year, there has been an upward trend since 1944 (table 17). One of the factors that has given impetus to irrigation was the advent of electricity and electrical irrigation pumps.

Table 17.--Irrigated acreage and farms reporting irrigation, Lincoln County, Oregon, 1939-59 1/

Year	Farms reporting irrigation	Acreage irrigated	Percentage of farms irrigating	Average acres irrigated
	Number	Acres	Percent	Acres
1939	30	243	3.1	8.1
1944	16	241	1.7	15.1
1949	42	575	5.9	13.7
1954	57	1,522	8.4	26.7
1959	53	1,077	10.5	20.3

1/ U. S. Census of Agriculture.

Although the number of farms irrigating has increased from about 3 percent in 1939 to 10 percent in 1959, the average acreage irrigated is still small. For instance, 59 percent of the farmers reporting irrigation in Lincoln County in 1959 irrigated less than 19 acres, and only 11 percent irrigated over 50 acres (table 18).

Table 18.--Distribution of farms reporting irrigation by acreage intervals, Lincoln County, Oregon, 1959 1/

Acres irrigated	Farms reporting	Percentage distribution
	Number	Percent
1 to 9	21	40
10 to 19	10	19
20 to 29	8	15
30 to 49	8	15
50 to 99	5	9
100 to 199	1	2
Total	53	100

1/ U. S. Census of Agriculture.

Future Irrigation

Opportunities for expanding irrigated acreage in the basin appear limited from both a physical and economic standpoint. The most limited physical factor is the availability of suitable land. There are 148,510 acres of land capability classes I through IV in the basin (table 19). On the basis of soils alone, this is the land that is generally susceptible to irrigation. However, only about 42,850 acres are presently being used as cropland or cropland pasture. The rest is in timber, brush, swamp, and other noncropland uses.

Table 19.--Estimated present and potential cropland and irrigable land, Middle Coast Drainage Basin, Oregon 1/

Item	Total basin
	Acres
Land capability classes I-IV	148,510
Total cropland	42,850
Potential cropland	15,640
Land developed for irrigation	6,420
Land irrigated, 1959	4,300
Potentially irrigable land	29,590

1/ Soil Conservation Service, USDA River Basin Survey Party data.

Estimates obtained from the USDA reconnaissance survey of the basin indicate that there are about 15,640 acres that could readily be converted to cropland use. It was also estimated that an additional 29,590 acres could readily be irrigated. Thus, about 62 percent of the present and potential cropland could be readily irrigated.

Two problems of a physical nature that complicate irrigation development in the basin are drainage and flooding. These problems are covered in detail in the latter sections of this report, but it should be noted at this point that an area of about 17,300 acres is flooded annually, and about 14,800 acres of arable land has drainage problems. In many cases, these two problems are present on potential cropland and potential irrigable land.

Although limited, opportunities for additional cropland and irrigation development exist in the basin. The degree to which this development occurs will depend on several economic and social factors.

Agriculture is predominantly based on forage crops which sustain dairy and livestock production. It is anticipated that forage production will continue to be the most important cropland use in the basin. Major changes in cropping patterns would require new marketing outlets, and this area is in a less competitive position to supply these markets than other areas closer to population centers and marketing and processing plants. Also, the agricultural land base is probably not large enough to entice a fruit or vegetable processing plant to the area. Thus, any increase in specialty crops will be dependent on local demand.

Dairy and livestock products have become the main agricultural commodities in the basin because of the favorable climatic conditions for production of pasture. Irrigation enables the farmer to increase forage production in the low rainfall months of June through August. To determine the effects of increased forage production from irrigation on farm income would require a detailed study. Developments to date, however, indicate that many farmers have been reluctant to make the required investments for irrigation. In the long run, the demand and prices for dairy and livestock products and the relative competitive situation between this area and other producing areas will have a bearing on irrigation development in the basin.

Possibly the most important factor that will affect the demand for irrigation water is the recent trend in shifts of valley cropland with river frontage into summer homesites and recreational use. In the past, most of the summer homes have been constructed along the ocean front. As these limited sites are becoming built up, interest is shifting to river frontage sites. Several homes have already been constructed along the Salmon, Siletz, Siuslaw, and Alsea Rivers, and additional subdivisions are planned along these and other rivers. The Lincoln County Agent reports growing interest and inquiries from people within and out of state for small homesite tracts along the major rivers. If these developments continue, and indications are that they will, the need for water in these areas will be for domestic use rather than for agriculture.

WATER RELATED PROBLEMS, NEEDS, AND OPPORTUNITIES

GENERAL

The manner in which farm, forest, and range lands are managed has a direct impact on the yield and quality of water. Land use affects the suitability of water for wildlife, recreation, and other human uses. Land use and management practices can create or aggravate a host of water problems involving water excesses, shortages, and quality. Correction of land use problems will usually result in reduction of the related water problems.

Water resources influence all segments of the economy of the basin. Better use and development of these resources are necessary for the advancement of agriculture. Industry and community existence is based upon a dependable supply of good quality water. Navigation, recreation, fish life, and pollution abatement are affected by volume and depth of flow; therefore, yield and seasonal availability of water is of prime importance in all areas of use.

WATER SUPPLY AND REQUIREMENTS

Average annual precipitation in the Middle Coast Drainage Basin ranges from about 200 to 35 inches (map 2). In the agricultural parts of the basin, rainfall probably averages less than 10 inches during June through September. Thus, the basin has a summer period of water shortage for agricultural uses and a winter period of water surplus. This problem is accentuated by relatively low mountain elevations, which preclude the accumulation of a significant snowpack, and the relative shortness of many of the coastal streams which also hastens runoff. This combination results in waste of water and necessitates planned storage to improve efficiency and provide for expansion in the use of water.

The total water resources are more than adequate for present and future agricultural needs. Total average annual yield after current consumptive use for this 1,511,400-acre basin is about 8,451,000 acre feet. The annual runoff probably ranges from 30 to nearly 100 inches. The data in table 20 were compiled for each watershed. These data were based on existing runoff records and the Weather Bureau isohyetal map (map 2).

The average annual precipitation for the entire basin is about 88 inches, and the average annual runoff is 71 inches; about four-fifths of the precipitation is not consumptively used in the basin at the present time.

Water from wells and springs is used to a limited extent for domestic, municipal, industrial, and livestock but not for irrigation. The supply from wells is often not dependable in either quantity or quality; however, there

Table 20.--Average annual runoff and precipitation by watershed, Middle Coast Drainage Basin, Oregon, 1964 1/

Watershed	Average annual precipitation	Average annual runoff	
	Inches	Inches	Acre feet
A. Salmon River	110	90	369,100
B. Devils Lake	102	82	324,000
C. Siletz River	115	95	1,543,700
D. Otter Rock	66	46	114,600
E. Yaquina River	80	60	792,000
F. Beaver Creek	79	59	152,900
G. Alsea River	95	75	566,800
H. Upper Alsea River	93	63	711,300
I. Waconda Beach	87	67	56,500
J. Yachats River	100	80	189,900
K. Five Rivers	96	76	489,600
L. Lake Creek	92	72	867,400
M. North Lane Coast	96	76	353,400
N. North Florence	77	57	64,700
O. North Fork Siuslaw River	87	67	245,800
P. Siuslaw River	86	66	577,600
Q. Wildcat Creek	65	45	130,800
R. Upper Siuslaw River	50	34	479,100
S. Duncan Slough	81	61	36,800
T. Siltcoos Lake	75	55	385,400
Total basin	88	71	8,451,400

1/ USDA Soil Conservation Service.

is usually sufficient water in the alluvial deposits and sand dune areas for domestic and livestock purposes.

In general, it can be concluded that there is a surplus of water in the basin during most of the year, but the supply is barely adequate for agricultural and other uses during the summer months. During this period, there is very little room for expansion from natural flows and ground water sources.

Irrigation

The major irrigated crops in this basin are grass and legumes for pasture and hay (table 10). The net irrigation requirement for these crops at an assumed 44 percent efficiency is about 2 feet of water per acre. At this rate, only 12,900 acre feet is required for 6,420 acres of irrigated land, or less than 0.2 percent of the total annual runoff; however, less than 5 percent of the runoff occurs during the irrigation season (June through September). About 3 percent of the yield during this season is required for irrigation at present. Thus, it would appear that water supplies for the basin are adequate for irrigation; however, there are critical water supply problems in some areas. For instance, two of the watersheds have a water shortage at the present time (table 21). Other watersheds especially near the tidal areas have not developed irrigation because of a shortage of dependable fresh water.

Table 21.--Summary of small watersheds with inadequate irrigation water supply, Middle Coast Drainage Basin, Oregon, 1964 1/

Item	Unit	Basin total
Watersheds studied	Number	20
Watersheds with water shortages for presently irrigated land	Number	2
Presently irrigated land with water shortages	Acres	400
Watersheds with inadequate water for potential irrigable land	Number	18
Potential irrigable land needing surface water development	Acres	21,160

1/ USDA River Basin Survey Party data.

It is estimated that an additional 29,600 acres could be readily irrigated. This is over four times the acreage presently irrigated; however, there are 148,500 acres in land capability classes I through IV, most of which is adaptable to irrigation in varying degrees (table 2). All watersheds have some potentially irrigable land. If all irrigated and potentially irrigable land were adequately irrigated and growing about the same types of crops presently grown, approximately 72,000 acre feet of water would be required. This would amount to less than one percent of the annual basin yield but is about 17 percent of the flow during the irrigation season.

It is apparent that water must be conserved and developed in some areas before irrigation of agricultural land could be expanded to this extent.

Livestock

There is usually an adequate water supply for consumptive use of livestock in this area of abundant rainfall. In most areas, natural streams and springs provide sufficient quantities without additional developments.

Forestry and Related Uses

Almost all of the annual water yield from the Middle Coast Drainage Basin comes from forest land. Forest land is vitally important in controlling quality, quantity, and timing of water yield. At low elevations, forest cover helps maintain soil conditions that encourage infiltration of precipitation. Trees, brush, and organic litter protect the soil from the eroding action of rainfall. Under normal forest conditions, water is percolated into the ground water storage for later gradual release instead of rapidly running off. Trees provide shade along rivers and streams, helping to maintain water temperatures suitable for fish life.

There are few water supply problems on forest land in the basin. Natural streamflows are generally adequate to meet all consumptive requirements. Some pollution and siltation problems have developed where careless timber harvesting has occurred or where forest fires have burned over watersheds.

Water supply problems are expected to become greater as use of forest land is intensified and as the demand for water for agriculture and industry increases. Prevention of stream pollution will be a more serious problem with increased recreational use and improvement of access to all parts of most watersheds.

There will be increasing concern in maintaining adequate streamflows and lake levels for fish, wildlife, and recreation. Additional needs for larger water supplies for irrigation, domestic, municipal, and industry will have to be met by greater reservoir storage of water from forested watersheds. If reservoirs are drawn down or streamflows lowered during the season of heavy recreational use, the water becomes less attractive for recreation, pollution problems increase, and fish life may be endangered.

Large quantities of water may be needed for forest related industry in the future, particularly for those plants producing products from wood pulp. Reservoir storage will be needed to provide a dependable supply for such industry in most parts of the basin.

Recreation

Water supply problems associated with recreation are expected to increase with the increase in recreation use. Increasing supplies of potable water will be necessary. It is evident that ground water will have to be utilized where possible. In other areas, treated surface water will be the only source.

Coupled with supply will be sanitation problems. The existing sanitation facilities are being overtaxed during the vacation season in many areas now. Existing pit toilets and cesspools which are now inadequate need to be replaced by approved sewerage disposal systems especially in the dune area. It is possible that recreation areas will have to contribute to the maintenance of sanitary districts to solve this increasingly serious problem.

WATERSHED MANAGEMENT PROBLEMS AND OPPORTUNITIES

Maintenance and improvement of the condition of all tributary watersheds in the basin should be continued. In general, the optimum watershed conditions will prevail when all resources are managed for sustained production. The most important management problems and opportunities for improvement pertaining to agriculture, range, and forestry are outlined in the following sections.

Agricultural Land

From an agricultural standpoint, arable land is the more limited resource when compared to water. In order to make the best use of this more limited resource, it is imperative that it be developed and its use be intensified. In order to do this, there is need for more control of the water supply. Many native and marginal pasture and hay fields should be planted to better adapted species of grasses and legumes and managed for increased

Photo 26.--Part of this field near Alsea which has been limed and fertilized is being seeded to a selected grass and legume in alternate rows, Oregon, 1963. SCS photo NO. 7-1457-11

production (photo 26). The native grass fields not best suited for cultivation should be replanted to trees and managed for this primary use. A summary of the water related problems and the measures needed to improve them follows.

Flooding. Flood problems in the Middle Coast Drainage Basin result from both natural factors and human management of the land. Modern man, through his intensive use of the land and other natural resources, has greatly intensified flooding problems in some areas, while in other areas, he has protected the land and used it for agricultural and urban development. Map 8 shows the major flood problem areas in the basin.

The two main sources of floodwaters in this basin are the rapid runoff of rain and melting snow and ocean tidal action.

Floods are most likely to occur during the November to March heavy precipitation period but may occur as early as September or as late as May. Fairly continuous rainfall during this period when the ground is saturated causes heavy runoff from the steep upper portions of the watersheds. Usually very little precipitation is retained in the form of snow. When the heavy runoff reaches the lower portions of the streams with flatter gradients, the water overflows the channels and floods many of the fields where it drops its sediment and debris.

Flooding by inundation from ocean tidal waters is common along the lower parts of the coastal watersheds. Dikes and tide gates have been installed to protect many areas, but some of these structures are inadequate or in need of repair (photo 27). Many other areas are entirely without such protection.

Photo 27.--An inadequate dike and tide gate is being repaired after damage from high water, North Fork Siuslaw River, Oregon, 1963. SCS photo NO. 7-1391-12

Flood damage has been particularly severe when high tides and heavy runoff occur simultaneously because then the floodwaters from the higher watershed areas are seriously impeded by the high tides causing the major floods in the basin. Such major floods appear to have about a ten-year frequency. The movement of beach sands by wind and water sometimes partially blocks the ocean outlets of some streams such as Beaver Creek making floods more frequent and severe.

Spring and summer floods from cloudbursts are practically unknown in this basin.

The problems to agriculture resulting from floods range from erosion and sedimentation to losses of crops and property. Agricultural damages consisting primarily of crop and property losses account for much of the total evaluated flood damage. Crop damage is minimized because most of the land is in sod-forming crops. Floods during the growing season are practically nonexistent, but the spring and winter floods cause some damage to crops by deposition and washing out roots, seeds, and seedlings. The expense of removing debris and silt from fields before re-establishing a crop is often almost prohibitive.

Manmade structures and improvements are often damaged by flooding. Some towns and farmsteads have, in the past, suffered from flood damage. Many country roads are damaged by the destruction of bridges, culverts, undercutting, and sedimentation. Municipal and domestic water supplies and diversion works are often damaged by high water and sediment.

It is very costly to remove sand, gravel, logs, and other debris deposited in channels, fields, ditches, and other improvements by major floods (photo 28).

Photo 28.--The remains of a destroyed building, logs, and other debris have been deposited on this dike. They will have to be removed, Siuslaw River, Oregon, 1951. SCS photo NO. 7-367-10

There is need for more stream-channel improvement, bank protection, and storage capacity in reservoirs to reduce flood damages.

Erosion. Land damage from erosion, leaching, scour, and deposition is significant but very difficult to evaluate and is probably inadequately appraised.

Most of the arable land is effectively protected from rill and sheet erosion by the growing of perennial sod-forming crops; however, when such a crop is plowed for re-establishment or replacement by annual crops, care should be taken to insure the soil is protected during the months of high precipitation and overflow. This can be done by careful selection of the time of working the fields and planting or by the use of good well established winter cover crops.

Wind erosion on agricultural land is not a serious problem at present because most cultivated land is either wet or fine textured enough to resist wind action, or it is protected from wind by crops, trees, or hills. However, it could be more serious if the marine terrace soils near the ocean were cleared and cultivated.

Considerable land is lost through streambank erosion. Damage is usually most prevalent in the swifter portions of the streams, but larger slower portions have also contributed to the problem. There is need to protect banks with rock and vegetation and remove gravel bars, drift, and brush where they are restricting flow and directing currents toward the bank (photo 29). Dredging in the lower parts of the larger streams is sometimes required to increase capacity and aid navigation. Stream channel work is usually most beneficial when a complete unit of channel is improved in a single coordinated project rather than by piecemeal work by individual landowners.

Photo 29.--Debris in Maple Creek should be removed so it will not cause bank erosion and overflow, 1964. SCS photo NO. 7-1529-11

Irrigation. Irrigation is a major consumptive use of water in the Middle Coast Drainage Basin. It has been developed by the efforts of individuals, but in some areas much of the future development will require action by groups.

Water is applied almost exclusively by sprinkler which is the easiest method to manage under existing conditions. To assure maximum benefits and least damage from irrigation, even the best designed systems need careful attention to the amount and frequency of water application; both should be adapted to the soil, crop, and weather. The technical advisor and farmer

are in need of more factual information on water-holding capacity and intake rates of soils to facilitate more efficient use of water and to protect the land from leaching and erosion.

Drainage. Approximately 23,200 acres, or about 16 percent of the arable soils, have a major wetness problem (table 22). These figures are based upon the Conservation Needs Inventory as some of the basin has not been surveyed. Those areas that have been surveyed have not been summarized by class and problem.

Some wet soils have been drained to a degree suitable for the crop grown or are being used for purposes that do not require drainage. An estimated 14,800 acres, or about two-thirds of the excessively wet soils, need to be drained for best production under present use. The majority of this land could be drained with tile although open outlets would also be required in some places. Besides increasing production, drainage of this land would also increase the number and variety of crops that could be grown. In some cases, the water drained from the land might be used for irrigation.

Table 22.--Estimate of acreage of soils within land capability classes I-IV whose major problem is wetness and the total acreage needing drainage, Middle Coast Drainage Basin, Oregon, 1964 1/

Land capability class	Unit	Basin total
I	Acres	...
II	Acres	9,420
III	Acres	11,740
IV	Acres	2,030
Total	Acres	23,190
Area needing drainage	Acres	14,790

1/ USDA River Basin Survey Party and Soil Conservation Service.

In this basin, the elimination of prolonged and frequent flooding is often a prerequisite of successful drainage. In most cases, this can be classified as flood control; however, surface drainage is required in some instances where the land is nearly level. Tidal areas frequently fit into this category (photo 30).

Along with tidal waters, seepage waters from higher land are among the most common sources causing drainage problems. Photo 31 shows an example of a field that is extremely wet from seepage water. Photo 32 shows a field that has been drained by using an interception ditch; however, random or pattern type tile systems are also necessary to drain many areas.

Forest and Range Lands

Careful management of forest and range resources can result in maximum economic and social benefits without impairment of soil and watershed values.

Photo 30.--Pasture on tide lands is often covered with water even when protected by dikes and tide gates. Surface drainage is needed before subsurface drainage can be efficient, Yaquina River, Oregon, 1964. RBSP photo NO. 7-1541-4

Photo 31.--The wet area through the center of the picture is caused from water seeping out of the hillside above it, Siuslaw S&WCD, Oregon. SCS photo NO. 7-1381-1

Photo 32.--Sometimes a field can be drained with a well placed interception ditch, Siuslaw S&WCD, Oregon. SCS photo NO. 7-1529-12

However, improper management of these resources can produce or intensify flood, erosion, and sedimentation problems. Forest and grass lands are generally on steep ground where the hazard from water erosion is intensified. Water erosion by rapid runoff of precipitation may be very damaging if protecting vegetation is removed from large areas (photo 33).

There is need for improvement of the condition of watersheds in the basin. On public land, good watershed management is a matter of public policy which should be strengthened and extended to all phases of forest and range resource management. On private land, good watershed management provides few direct profits to the landowner since he uses little of the water that flows from his land and any reduction in soil fertility due to poor watershed management may not be apparent for a long time; however, good watershed management on all forest and range land is vital to water users and to landowners in downstream areas. Recently, public pressure and enforcement of antipollution laws have caused some improvement in watershed management on private land. There is need for much additional improvement. Some factors that would tend to produce better watershed management are:

1. Greater monetary returns from tree farming would encourage landowners to keep their land in a productive condition and help provide for soil protection. Roads constructed and maintained in a good condition would tend to be a lesser source of erosion.

2. Continuation and strengthening of Extension Service, Soil Conservation Service, and State Farm Forester programs to

Photo 33.--Downhill cable yarding intensifies erosion problems. Poppino photo NO. 3

inform landowners and the general public of the value of water and watersheds and the importance of good watershed management would encourage a gradual improvement in watershed management practices.

3. Increased public pressure from recreationist, fishermen, and other water users would cause many private owners to give greater consideration to good watershed management practices.

4. Enactment and enforcement of stricter regulations controlling land management practices that produce stream siltation, debris jams, and flood hazards may be necessary if forest and range landowners fail to meet their watershed management responsibilities. Regulation has often been necessary to control other sources of water pollution such as sewage and wastes from manufacturing processes.

Planning and timing of logging operations without adequate regard for such factors as soil characteristics, steepness of slopes, and moisture conditions magnify the erosion hazards. Poorly planned and constructed roads are major sources of erosion. Slash resulting from logging or road right-of-way clearing that accumulates in streams can block fish passage and pose a threat of flash floods during severe winter storms (photo 34).

Climatic conditions in the basin are favorable for rapid revegetation of cutover forest land; however, skid trails, fire lines, and road cut and fill slopes present major erosion hazards and often need special measures such as adequate drainage and installation of a protective plant and mulch cover.

Overgrazing of forest and range land is a serious watershed management problem. Farmers and ranchers graze cattle, goats, and sheep on cutover forest land. Some grazed forest land is too steep or has too great an erosion hazard to be suited for this use. Overgrazing depletes soil protecting vegetation, destroys tree seedlings, and compacts the soil. Some grazed forest and range lands might be more profitably used for forest development, and the relatively small amount of forage which would be lost could be replaced through better management of cropland pasture.

Photo 34.--Logging debris which accumulates in streams can block fish passage and pose a threat during severe winter storms. RBSP photo NO. 7-1541-11

Many of the ownerships are too small for efficient, profitable management on an individual basis. The owners often lack forestry and range training or experience and will not consult or follow advice from USDA consultants. For these reasons, many small private holdings are rather poorly managed.

For instance, data from the 1952 Timber Resources Review indicated that the timber on small private holdings is generally cut at too small a size for maximum profits, and there is often inadequate provision for regeneration; however, small forest holdings owned by farmers tend to be better managed than those owned by nonfarmers, but farmers tend to put their forest land to other uses such as range that will produce cash returns in a shorter time. Forest values for water, recreation, and wildlife are often neglected on small holdings because of indifference or economics.

Forest land managers need additional knowledge about many phases of forestry to enable them to do a better job of watershed management. One of the most important needs is for more detailed information about soils and geology so areas with serious surface erosion, slump, and slide hazards may be recognized. Increased detailed hydrological data for forested watersheds are also needed for better planning of drainage structures on access roads. Timber harvesting methods that minimize watershed damage need to be encouraged.

Related to this need for additional technical information is the apparent need for re-orientation of thinking concerning watershed management and its place in timber management, recreation management, wildlife management, and range management. Many resource managers think of watershed management as a special category or an individual step in their operations. Actually it is an integral part of the total resource management situation and should have an important place in all management decisions.

Along with increased knowledge and tools for better watershed management must go increased recognition by land managers of their responsibility for management of all resources. Management practices that can help enhance watershed values without diminishing the value of forest and grass land for other uses have been stated previously. The public land managers can exert an important influence in encouraging good watershed management practices. They play a dominant role in determining the management of public and private land. Thus, they have an opportunity and responsibility to sell multiple use management of all watershed resources.

Recreation Areas

Careful management of recreation sites is necessary to enhance the existing resource. Allowing misuse of these areas can result in increased runoff, erosion, sedimentation, and debris in streams. To prevent complete destruction of the resource, it may be necessary to temporarily close some heavily used recreation areas and allow the scars of excessive use to heal. Uncontrolled, shifting sand--the main attraction in the dunes area--is a real problem in maintaining recreation developments (photo 35).

Continued development of multiple use observation points, where the public is made aware of good watershed and forest management practices, is to be encouraged by all land managers--both public and private. The use of interpretive signs is a necessity because good forest management can look like utter devastation to the uninitiated when he sees a clearcut immediately after slash burning.

Photo 35.--Uncontrolled sand increases costs of maintaining improvements near the dunes area. FS photo NO. 498658

WATER DEVELOPMENT

There is potential for development of the water resources of the Middle Coast Drainage Basin to better serve all phases of the economy. Ground water, surface water, and stored water can all be used to advantage to help meet the increasing water requirements of the area. Provision of adequate water supplies for agriculture will be one of the major purposes of future water development projects in the basin. For instance, an estimated 21,200 acres of existing and potential cropland could be irrigated if sufficient water supplies were developed. Better utilization of water supplies can result in ample water to irrigate this land; however, in the future, most major water development projects will need to include several phases of water use and control such as flood control, navigation, power, domestic, municipal, industrial, fish, wildlife, recreation, and pollution abatement.

For instance, there is an increasing need for recognition of fish life, wildlife, pollution abatement, and recreational values in the planning of water development projects throughout the basin. There will be an increasing demand for water-based recreational opportunities and an increasing need for reservoir projects to include provision for recreational development. Careful planning and consideration of all resource values is necessary if the maximum beneficial use of water is to be obtained.

Since the delineation of water resource needs for agriculture is a major purpose of this report, agricultural water uses are emphasized in the following sections pertaining to ground water, surface water, and water storage.

Ground Water

Ground water is being used to a limited extent in some areas mostly for domestic purposes from shallow wells and springs. Other sources of ground water include sumps and seeps. Ground water has proved to be quite limited in quantity in parts of the basin, and poor in quality in some parts. Future development of irrigation based upon ground water appears to be extremely limited. In the sand dune areas, there is considerable potential for domestic and industrial uses.

Surface Water

Almost all streams in the basin have some additional natural surface water available for present use during the irrigation season. It appears that 8,000 additional acres could be irrigated from natural flow water (table 23). Surface water availability will be discussed in each watershed in the next section of the report.

Storage

The conservation of excessive, often damaging, runoff water in reservoirs for flood protection and subsequent use for irrigation, industry, power, domestic, municipal, recreation, pollution abatement, and fish life has potential in the basin.

A summary of estimates from various parts of the basin has indicated that it would be necessary to construct both large and small reservoirs to supply water for about 21,000 irrigated acres for optimum agricultural development (table 23). This storage capacity can be developed where and when it is needed. There is a definite potential for more farm ponds and small reservoirs. In addition, there are many medium-sized reservoir sites of 100 to 25,000 acre feet storage capacity that should be considered for water development for individual and group needs. Table 24 summarizes reconnaissance data assembled by the Department of Agriculture on 50 sites that appear to have some merit and warrant future consideration. The locations of these sites are shown on map 8.

In order to be feasible, almost all new reservoirs need to be developed for multipurpose use, considering all possible uses and benefits from the stored waters.

Table 23.--Reconnaissance data on small watersheds, Middle Coast Drainage Basin, Oregon, 1964 1/

Item	Unit	Watershed A: Salmon River	B: Devils Lake	C: Siletz River	D: Otter Rock	E: Yaquina River	F: Beaver Creek	G: Alsea River	H: Upper Alsea River	I: Waconda Beach	J: Yachats River	K: Five Rivers	L: Lake Creek	M: North Lane Coast	N: North Florence	O: North Fork Siuslaw River	P: Siuslaw River	Q: Wildcat Creek	R: Upper Siuslaw River	S: Duncan Slough	T: Siltcoos Lake	Total basin
Farms	Number	50	30	170	5	180	20	40	110	3	20	40	90	10	20	50	50	30	80	12	50	1,060
Watershed area	Acres	49,200	47,400	195,000	29,900	158,400	31,100	90,700	135,500	10,100	28,500	77,300	144,600	55,800	13,600	44,000	105,000	34,900	169,100	7,200	84,100	1,511,400
GENERAL LAND USE:																						
Forest land	Acres	46,260	42,800	182,720	27,000	138,390	29,460	83,880	128,700	9,900	26,650	73,790	133,680	54,850	10,650	39,900	90,650	33,070	159,640	6,000	55,630	1,373,620
Grazed	do.	1,900	2,300	3,500	50	6,700	1,000	5,200	5,800	50	700	1,000	2,500	700	300	300	800	900	2,300	300	700	37,000
Nongrazed	do.	44,360	40,500	179,220	26,950	131,690	28,460	78,680	122,900	9,850	25,950	72,790	131,180	54,150	10,350	39,600	89,850	32,170	157,340	5,700	54,930	1,336,620
Cropland	Acres	1,000	700	5,400	50	6,000	700	1,000	5,000	20	600	1,630	5,700	300	400	2,900	1,900	900	5,600	700	2,350	42,850
Nonirrigated	do.	900	600	4,720	50	5,100	600	700	3,930	20	530	1,190	4,630	300	390	2,450	1,830	850	5,150	600	1,890	36,430
Irrigated	do.	100	100	680	...	900	100	300	1,070	...	70	440	1,070	...	10	450	70	50	450	100	460	6,420
Rangeland	Acres	1,100	600	2,580	10	2,600	510	1,600	910	10	290	1,000	1,000	300	50	400	240	300	1,800	200	170	15,670
Other	Acres	840	3,300	4,300	2,840	11,410	430	4,220	890	170	960	880	4,220	350	2,500	800	12,210	630	2,060	300	25,950	79,260
IRRIGATION:																						
Water source:																						
Streamflow	Acres	95	95	650	...	860	100	280	1,050	...	70	440	1,070	...	10	450	70	50	450	100	460	6,300
Reservoir	do.	5	5	30	...	40	...	20	20	...	...	...	...	...	...	...	...	...	...	...	...	120
Ground water	do.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Method of application:																						
Sprinkler	Acres	100	100	630	...	900	100	300	1,070	...	25	440	1,070	...	5	450	70	50	415	100	460	6,285
Gravity	do.	...	...	50	...	...	...	...	...	...	45	...	...	...	5	...	...	...	35	...	...	135
Water rights	Acres	293	99	876	96	806	102	285	1,809	25	44	226	678	8	10	373	113	40	782	75	263	7,003
Water shortage	Acres	...	...	...	...	...	...	...	...	...	...	...	300	...	...	...	...	...	100	...	...	400
POTENTIAL:																						
Cropland	Acres	1,000	500	3,000	50	1,500	700	500	1,500	20	300	800	1,000	50	70	600	250	500	2,800	50	450	15,640
Irrigable land	Acres	1,000	800	5,000	70	4,500	1,200	1,000	4,000	20	700	700	3,000	250	150	1,500	1,200	600	1,600	400	1,900	29,590
Available water	Ac. ft.	369,100	324,000	1,543,700	114,600	792,000	152,900	566,800	711,300	56,500	189,900	489,600	867,400	353,400	64,700	245,800	577,600	130,800	479,100	36,800	385,400	8,451,400
Water source:																						
Streamflow	Acres	200	700	500	60	500	300	400	1,000	20	200	200	500	200	150	750	600	400	700	50	1,000	8,430
Storage reservoir	do.	800	100	4,500	10	4,000	900	600	3,000	...	500	500	2,500	50	...	750	600	200	900	350	900	21,160
Ground water	do.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
DRAINAGE:																						
Arable land needing drainage	Acres	800	450	2,000	...	1,500	900	500	2,000	...	100	120	1,000	20	100	1,500	1,000	50	1,500	450	800	14,790
FLOODING:																						
Area	Acres	1,000	550	1,500	...	1,500	1,000	800	900	10	100	400	2,000	800	100	2,000	1,500	100	1,300	500	1,200	17,260
STORAGE:																						
Ponds (existing)	Number	4	...	2	...	13	...	3	12	...	...	4	1	...	1	1	...	...	1	...	1	43
Reservoirs (existing)	Number	...	...	2	...	1	...	...	2	...	...	1	3	...	...	...	...	...	1	...	...	10
Reservoir sites studied	Number	3	2	7	2	2	2	1	3	...	2	3	5	1	...	4	2	1	7	...	3	50

1/ Based on data collected by the USDA River Basin Survey Party. Estimates provided by local personnel of the Soil Conservation Service, Forest Service, and County Extension Service.

Table 24.--Reconnaissance data on some reservoir sites, Middle Coast Drainage Basin, Oregon, 1964 [1/]

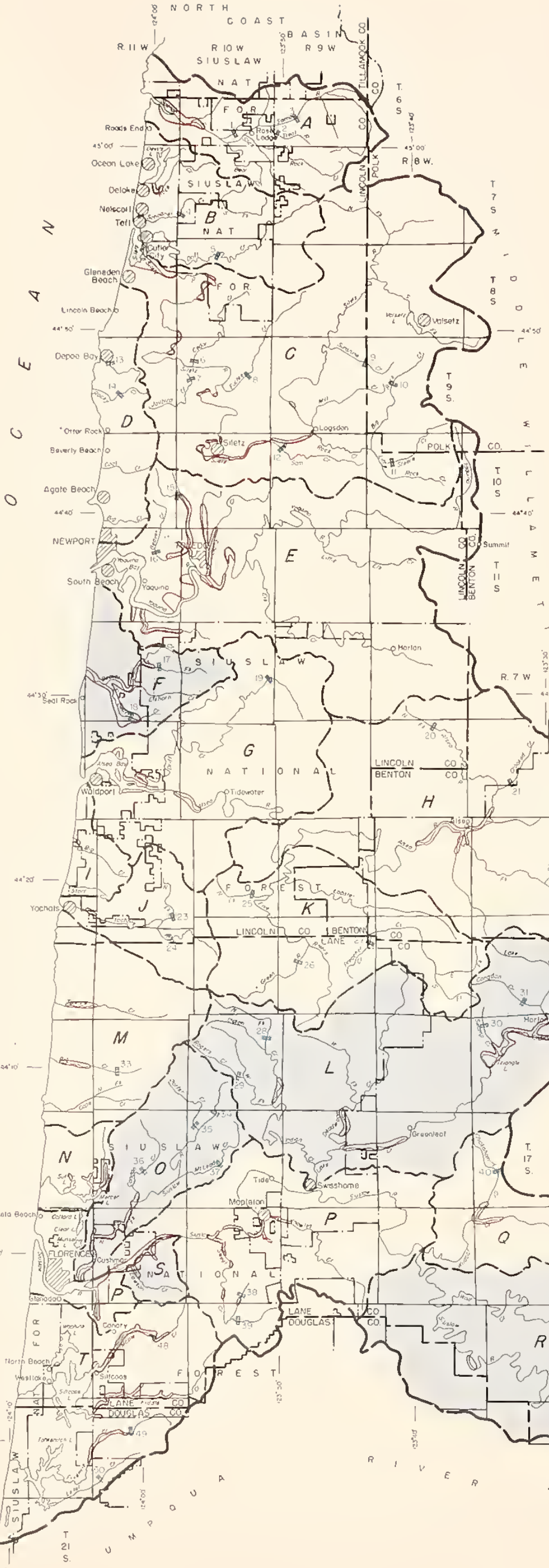
Stream Name	Watershed index Letter	Reservoir index Number	Location Township	Location Range	Location Section	Drainage area Sq. mi.	Estimated annual yield Ac. ft.	Storage capacity Ac. ft.	Reservoir water depth Feet	Reservoir surface area Acres	Top length of embankment Feet	Estimated embankment volume Cu. yds.	Fill storage Cy/ac. ft. [2/]	Possibilities Uses [3/]
Panther Creek	A	1	6S	10W	34	1.7	6,700	640	64	25	175	63,500	99	I,R
Treat Creek	A	2	6S	10W	36	2.3	10,600	1,190	96	31	400	313,100	263	I,F,R
Salmon River	A	3	6S	9W	29	20.9	94,900	5,620	90	156	580	371,800	66	I,F,R
Schooner Creek	B	4	7S	10W	30	14.6	55,400	2,230	60	93	600	202,200	91	I,F,R,S
Drift Creek	B	5	8S	10W	4	30.8	139,700	2,160	58	93	300	108,200	50	I,F,R,S
Cedar Creek	C	6	9S	10W	8	13.2	50,700	4,180	60	174	900	278,100	66	I,F,R
Jaybird Creek	C	7	9S	10W	17 & 18	4.8	12,600	2,500	50	125	450	112,700	45	I,F,R
Euchre Creek	C	8	9S	10W	14	11.5	48,900	2,310	62	93	700	242,400	105	I,F,R
Sunshine Creek	C	9	9S	9W	12	5.7	28,800	2,990	43	174	250	42,600	14	I,R
Big Rock Creek	C	10	9S	8W	17 & 20	6.6	33,400	3,980	50	199	300	93,900	24	I,R
Steere Creek	C	11	10S	8W	8	7.9	31,700	7,330	84	218	400	226,300	31	I,F,R
Sam Creek	C	12	10S	9W	6	14.4	43,000	10,100	81	311	550	337,000	34	I,F,R,S
South Depoe Bay Creek	D	13	9S	11W	8	2.6	5,700	900	30	75	175	14,800	16	R,S
Rocky Creek	D	14	9S	11W	21	2.5	5,400	1,000	50	50	300	55,300	55	R,S
Depoe Creek	E	15	10S	10W	19	3.5	7,700	4,660	55	212	650	187,200	40	I,F,R,S
Beaver Creek	E	16	11S	11W	11	3.9	8,200	390	13	75	200	5,500	14	I,R,S
North Fork Beaver Creek	F	17	12S	11W	14	9.2	31,500	7,200	100	180	700	550,000	76	I,F,R
South Beaver Creek	F	18	12S	11W	33	3.8	12,200	1,800	40	112	450	64,500	36	I,F,R
Drift Creek	G	19	12S	10W	24	20.5	81,900	3,110	48	162	350	73,600	24	I,F,R
North Fork Alsea River	H	20	13S	8W	3	6.0	23,900	1,140	42	68	200	34,700	30	I,F,R
Crooked Creek	H	21	13S	7W	21	14.1	56,400	4,750	112	106	750	671,000	141	I,F,R
Peak Creek	H	22	14S	7W	24	10.4	33,900	5,640	94	150	400	271,600	48	I,F,R
North Fork Yachats River	J	23	14S	11W	35	10.1	40,300	2,500	50	125	300	75,100	30	I,F,R
Yachats River	J	24	15S	11W	2	14.1	56,500	2,550	57	112	700	208,800	82	I,F,R
Cascade Creek	K	25	14S	10W	26	4.9	19,700	1,240	50	62	250	47,400	38	I,F,R
Green River	K	26	15S	9W	17	8.1	32,400	1,110	32	87	300	29,300	26	I,F,R
Preacher Creek	K	27	15S	9W	12	5.4	20,600	1,500	50	75	500	112,700	75	I,F,R
North Fork Indian Creek	L	28	16S	10W	11 & 12	5.9	23,500	5,370	80	168	500	186,700	35	I,F,R
Rogers Creek	L	29	16S	10W	22 & 27	3.5	13,700	1,190	48	62	350	73,600	62	I,F,R
Swamp Creek	L	30	16S	7W	6	2.8	10,800	1,500	50	75	900	187,800	125	I,F,R
Congdon Creek	L	31	15S	7W	34	7.8	30,200	2,340	78	75	500	259,500	111	I,F,R
Swartz Creek	L	32	15S	7W	36	4.5	9,700	1,860	50	93	650	150,200	81	I,F,R
Big Creek	M	33	16S	11W	20	8.9	35,800	1,860	93	50	350	242,000	130	R,S
North Fork Siuslaw River	O	34	17S	10W	5	9.9	37,400	2,160	51	106	700	173,800	80	I,F,R
Porter Creek	O	35	17S	10W	6	3.2	12,400	770	44	44	450	88,900	115	I,F,R
Condon Creek	O	36	17S	11W	22	3.1	10,900	1,740	70	62	600	264,300	152	I,F,R
McLeod Creek	O	37	17S	10W	21	5.1	17,500	2,430	75	81	600	297,200	122	I,F,R
Beaver Creek	P	38	18S	10W	34	3.3	12,000	2,860	55	130	600	175,300	61	I,F,R
Sweet Creek	P	39	19S	10W	10	7.3	26,800	740	33	56	300	31,000	42	F,R
Chickahominy Creek	Q	40	17S	7W	20	8.3	19,800	1,530	41	93	250	33,500	22	I,F,R
Eames Creek	R	41	19S	6W	7	5.0	6,600	1,000	50	50	400	93,900	94	I,R
Wolf Creek	R	42	19S	6W	13	6.3	6,700	6,360	71	224	650	254,300	40	I,F,R
Farman Creek	R	43	19S	5W	35	1.2	1,000	1,090	44	62	300	49,400	45	I,F,R
Hawley Creek	R	44	20S	4W	5	6.4	5,000	1,360	50	68	450	97,800	72	I,F,R
Kelly Creek	R	45	20S	4W	29	4.0	3,000	1,860	50	93	450	86,800	47	I,F,R
South Fork Siuslaw River	R	46	20S	4W	32	8.3	7,000	1,990	38	131	800	97,900	49	I,F,R
Letz Creek	R	47	20S	5W	29	7.1	6,000	1,440	48	75	200	36,800	26	I,F,R
Maple Creek	T	48	19S	11W	15	9.3	30,100	5,060	60	211	700	227,500	45	I,F,R,S
Fivemile Creek	T	49	20S	11W	16	6.8	22,100	1,440	20	180	400	19,100	13	I,F,R,S
Lietel Creek	T	50	20S	11W	30	2.8	8,800	440	25	44	250	14,700	33	F,R,S

1/ Based on a survey by the U. S. Department of Agriculture River Basin Survey Party.

2/ A comparative figure derived from dividing the estimated earth fill in cubic yards by the estimated water storage capacity in acre feet.

3/ I-irrigation, F-flood protection, R-recreation--fishing, hunting, and boating, S-water supply--industrial, municipal, and domestic.

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE M-5977



LEGEND

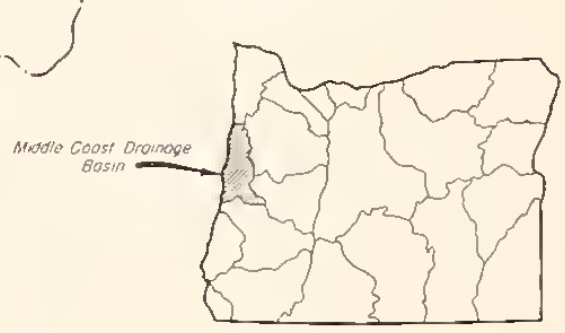
- Flood Problem Areas
- Drainage Basin Boundary
- National Forest Boundary
- Watershed Boundary
- Possible Reservoir Sites

WATERSHED CLASSIFICATION

- Best P.L. 566 Possibilities
- Others Studied

WATERSHEDS

- A SALMON RIVER
- B DEVILS LAKE
- C SILETZ RIVER
- D OTTER ROCK
- E YAQUINA RIVER
- F BEAVER CREEK
- G ALSEA RIVER
- H UPPER ALSEA RIVER
- I WACONDA BEACH
- J YACHATS RIVER
- K FIVE RIVERS
- L LAKE CREEK
- M NORTH LANE COAST
- N NORTH FLORENCE
- O NORTH FORK SIUSLAW RIVER
- P SIUSLAW RIVER
- Q WILDCAT CREEK
- R UPPER SIUSLAW RIVER
- S DUNCAN SLOUGH
- T SILTCOOS LAKE



DRAINAGE BASIN LOCATION

COUNTY LOCATION

MAP 8

INDEX MAP OF WATERSHED AREAS; POSSIBLE RESERVOIR SITES AND GENERALIZED FLOOD PROBLEM AREAS

MIDDLE COAST DRAINAGE BASIN

OREGON

SEPTEMBER 1964

2 0 2 4 6 8 10
SCALE IN MILES

103 - PAC - 7-E-17534-N

OPPORTUNITIES FOR WATERSHED PROTECTION AND FLOOD PREVENTION PROJECTS

DESCRIPTION OF PUBLIC LAW 566

The Watershed Protection and Flood Prevention Act, Public Law 566, as amended, authorizes the Secretary of Agriculture to cooperate with local organizations in planning and carrying out works of improvements for flood prevention and/or for the conservation, development, utilization, and disposal of water in watershed or subwatershed areas not exceeding 250,000 acres. The act provides for technical, financial, and credit assistance by the U. S. Department of Agriculture to landowners, operators, and other people living in small watersheds. Project-type action under the act is intended to supplement soil and water conservation programs and other programs for the development and flood protection of major river valleys.

WATERSHED SURVEY

The USDA River Basin Survey Party made a survey of the potential for P. L. 566 work in the Middle Coast Drainage Basin to provide information as a guide to long-range coordination and planning of possible future projects. The basin was divided into 20 tributary watershed areas which are designated by letter and are delineated on map 8. A preliminary survey was made of each watershed to gather basic reconnaissance data on land and water use and water related problems which are summarized in tables 23 and 24.

Information in these tables is based upon estimates by local personnel of the Soil Conservation Service, County Extension Service, Agricultural Stabilization and Conservation Service, and the Forest Service. Although it is of a reconnaissance nature, it has been cross checked with census and other sources. Data from this survey have been used throughout much of this report.

FACTORS THAT IMPROVE FEASIBILITY

A field reconnaissance and an evaluation of available data for each watershed were made to obtain additional information on opportunities for P. L. 566 action based upon watershed area, physiographic conditions, land use, water yield and its seasonal distribution, and water related problems and needs. Some of this material is limited because of a lack of time for making more detailed field observations; however, it was decided many of the water related problems of the Middle Coast Drainage Basin could be reduced or solved under P. L. 566. Under existing conditions and laws, it appears that a solution of these problems may be practicable and feasible

in several watersheds. The Survey Party's findings indicate that watersheds with the best possibilities for P. L. 566 action have a combination of some of the following conditions:

1. Most of the watershed is at low elevation with relatively low summer water yields.
2. The watershed contains highly erodible soils that are subject to action from wind and/or water.
3. The watershed has, or has potential for, a high degree of agricultural, residential, or industrial development.
4. The watershed has a large area suitable for irrigation development and lacks water sources that can be developed by individual farmers, but has water sources that can be developed by group action.
5. The watershed has localized flooding and/or drainage problems which are related to floods of moderate duration.
6. The watershed contains one or more storage sites which appear feasible for multipurpose development.

FACTORS THAT LIMIT FEASIBILITY

Some watersheds studied do not appear to be suitable for P. L. 566 action. These watersheds usually have a combination of some of the following conditions:

1. The watershed has high water yield and large peak flows which produce flooding and drainage problems that are beyond the scope of P. L. 566.
2. Most of the watershed needs are for land treatment on forest and range areas where there is presently little economic incentive for land treatment measures.
3. Only a small part of the watershed that would benefit materially from flood protection and drainage is under agricultural, residential, or urban uses, and there is limited potential for expansion of these land uses.
4. The watershed has minor drainage, flooding, and water supply problems that can best be solved through individual action.
5. Group irrigation development is not feasible in the watershed because of land capability factors.

FACTORS THAT COULD CHANGE FEASIBILITY IN THE FUTURE

There are several factors that were not taken into account in this study that in the future may affect the feasibility of a given watershed for P. L. 566 action:

1. Changes in basic laws and policies to give greater recognition to land treatment, flood control, recreation, wildlife, and fish life benefits would improve the possibility for P. L. 566 action in several watersheds.

2. Unforeseen demands for water arising from increased urbanization, industrialization, and demand for certain agricultural crops may improve the need for P. L. 566 action in some watersheds.
3. Small watershed projects may be feasible in some areas adjacent to, or part of, planned Corps of Engineers projects. Such small watershed projects could be supplementary to the larger project.
4. The degree of local interest in a given project will influence the immediate prospects for P. L. 566 action in many watersheds where projects appear to be physically and economically feasible. Interest in irrigation and more intensive land use will be particularly important as many potential projects center around irrigation development.
5. In a few instances, changing the boundaries of an area proposed for small watershed development might improve the possibility for P. L. 566 action. For instance, a watershed with suitable storage sites but small water requirements for irrigation, domestic, or other uses might be combined with an adjacent watershed with large water requirements but no storage potential.
6. Improvements made by individuals or groups in a watershed may reduce future benefits adversely affecting the possibilities of a P. L. 566 project.

SUMMARY OF REPORTS

Further detailed investigations would be necessary to determine engineering and economic feasibility of a given project. The Survey Party's findings are presented in individual watershed reports summarized in table 25 and shown on map 8.

Table 25.--Summary of watershed reports, Middle Coast Drainage Basin, Oregon, 1964 1/

Watershed	Project possibilities under P. L. 566
A. Salmon River.....	A project including flood protection, land treatment, and water development for irrigation and recreation use might be feasible, but more detailed study is required for determination.
B. Devils Lake.....	A project including flood protection, land treatment, channel improvement, and water development for irrigation, municipal, domestic, and recreation might be feasible under existing conditions and laws.
C. Siletz River.....	A project does not appear to be feasible under existing conditions and laws, but a smaller area

Table 25.--Summary of watershed reports, Middle Coast Drainage Basin, Oregon, 1964 1/--Continued

Watershed	Project possibilities under P. L. 566
C. Siletz River--Cont.	near the mouth could be feasible for flood protection, water management for irrigation, domestic, and drainage, and land treatment.
D. Otter Rock	A project does not appear to be feasible under existing conditions and laws.
E. Yaquina River	A project involving flood protection, drainage, land treatment, and water development for irrigation and recreation could be feasible on some parts such as Depoe Creek and Boone Slough, but not on the entire watershed under existing conditions and laws.
F. Beaver Creek	A project involving water management for irrigation, drainage, recreation, flood protection, channel improvement, and land treatment appears to be feasible.
G. Alsea River	A project does not appear to be feasible under existing conditions and laws for the entire area but projects on some parts of the area could be feasible.
H. Upper Alsea River	A project to develop water for irrigation, municipal, and recreation uses, flood protection, channel improvement, and land treatment might be feasible on all or parts of the watershed.
I. Waconda Beach	A project has no possibility under existing conditions and laws.
J. Yachats River	A project has little possibility under existing conditions and laws.
K. Five Rivers	A project has little possibility under existing conditions and laws.
L. Lake Creek	A project for flood protection, channel improvement, water management for irrigation, drainage, and recreation, and land treatment appears to be feasible for all or parts of the watershed.
M. North Lane Coast	A project does not appear to be feasible under existing conditions and laws.

Table 25.--Summary of watershed reports, Middle Coast Drainage Basin, Oregon, 1964 1/--Continued

Watershed	Project possibilities under P. L. 566
N. North Florence	A project does not appear to be feasible under existing conditions and laws.
O. North Fork Siuslaw	A project including flood protection, channel improvement, and water management for drainage, irrigation, and recreation appears to be feasible.
P. Siuslaw River	A project has little possibility under existing conditions and laws.
Q. Wildcat Creek	A project does not appear to be feasible under existing conditions and laws.
R. Upper Siuslaw River	A project to develop water for irrigation and recreation uses, flood protection, channel improvement, and land treatment appears to be feasible in the Lorane area and might be feasible for the entire watershed.
S. Duncan Slough	A project including flood protection, water management for irrigation, drainage, and land treatment appears to be feasible.
T. Siltcoos Lake	A project does not appear to be feasible under existing conditions and laws, but some parts of the watershed could be feasible.

1/ USDA River Basin Survey Party data.

Reconnaissance reports for each watershed are presented as follows.

Watershed A, Salmon River

Description. The Salmon River watershed contains 49,200 acres in Lincoln, Tillamook, and Polk Counties. With the exception of a small area in Polk County, the watershed is in the South Tillamook and Lincoln Soil and Water Conservation Districts. The Salmon River flows in a westerly direction from the Saddleback Mountains to the Pacific Ocean at Cascade Head. The watershed is about 15 miles long and ranges from 4 to 8 miles wide. Elevations vary from 3,000 feet to sea level with most of the agricultural land below 400 feet. Average annual precipitation is 110 inches. The average growing season in the agricultural area exceeds 200 days.

Soils occurring in the watershed include those on the upland, marine and alluvial terraces, and flood plains. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to extremely

steep. Parent material is from both igneous and sedimentary rock with approximately equal areas of each. Forest is the major use. In the Otis area, there are soils on terraces developed from marine sediments. They are moderately shallow to very deep, medium to coarse textured and are vulnerable to wind erosion when the vegetation is removed. Land use is forest, range, and urban development. Flood plain and alluvial terrace soils have a wide range of characteristics and suitability for use. They vary from moderately coarse to fine textured, moderately shallow to very deep, and very poorly to somewhat excessively drained. These soils support most of the agriculture development and are also used for forest, urban, and recreation.

A reconnaissance survey indicates there is 4,000 acres used for the production of either crops or livestock. Of this 1,900 acres is grazed forest; 1,100 acres is range; and 1,000 acres is cropped. About 100 acres is irrigated pasture, hay, berries, and specialty crops. Hay, pasture, and some specialty crops are raised on the nonirrigated land. There are 50 farms in the watershed.

Approximately 44,360 acres, or 90 percent of this watershed, is forested. It has been repeatedly burned. The accessible areas have been harvested and not replanted so in some areas there are extensive stands of alder. With the increased fire protection of the last twenty years, many old fern patches are now well stocked young stands of Douglas-fir.

The State Highway Commission is maintaining the J. H. Van Duzer Forest Corridor along Highway 18. This narrow strip of timber provides a forest atmosphere for the traveler. It also hides the slowly reforesting hills which would otherwise be visible.

Watershed Problems and Needs. Approximately 1,000 acres is flooded annually. The major portion of the flooding is in the lower tidelands downstream from Otis. Flooding is generally confined to rangelands, but with dikes and tide gates a large part of this area could be developed for cropland. In past years, some diking has been completed, and additional work is being planned. Erosion damage is minor although there is some streambank erosion which appears to be caused mainly from debris-choked streams. Estimates show that 800 acres of arable land needs subsurface drainage.

It is estimated that 1,000 acres of additional land is suitable for irrigation development. Reservoir storage would be required for 800 acres. Three reservoir sites (index numbers 1, 2, and 3) were studied in this watershed with a potential total storage of 7,450 acre feet. There are additional small farm-type sites.

Opportunities under P. L. 566. A project including flood protection, land treatment, and water development for irrigation and recreation use might be feasible. A project confined to the tideland area appears to be feasible.

Watershed B, Devils Lake

Description. The Devils Lake watershed contains 47,400 acres in Lincoln County. This includes three principal drainage areas, Drift Creek, Schooner

Creek, and the Devils Lake drainage. The watershed is in the Lincoln Soil and Water Conservation District. The largest drainage area is Drift Creek which flows in a westerly direction from Stott Mountain to the Siletz Bay. Schooner Creek also flows into the Siletz Bay, but the Devils Lake drainage empties into the Pacific Ocean through the D River. The watershed is about 13 miles long and averages about 6 miles wide. Elevations range from sea level to over 3,000 feet with most of the agricultural land below 250 feet. Average annual precipitation is 102 inches. The average growing season in the agricultural area exceeds 200 days.

There are upland, marine, and alluvial terrace, and flood-plain soils in the watershed. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. Parent material is from both igneous and sedimentary rock with most of the area being igneous. Forest, urban, and recreation are the uses. Soils on terraces developed from marine sediments occur along the coast from Taft to Roads End and around Devils Lake. They are moderately shallow to very deep, medium to coarse textured and are vulnerable to wind erosion when the vegetation is removed. Land use is urban development, recreation, forest, and range. Flood-plain and alluvial terrace soils have a wide range of characteristics and suitability for use. Characteristics vary from moderately coarse to fine texture, moderately shallow to very deep, and very poorly to somewhat excessively drained. These soils are used for agriculture, recreation, urban, and forest.

A reconnaissance survey indicates there is 3,600 acres used for the production of either crops or livestock. Of this, 2,300 acres is grazed forest; 600 acres is range; and 700 acres is cropped. About 100 acres is irrigated pasture and hay. The nonirrigated cropland produces pasture, hay, and holly. There are 30 farms in this watershed.

Approximately 40,500 acres of this watershed is forested. The central portion is in the Siuslaw National Forest and contains the small watersheds which are the source of water for Oceanlake, Taft, and Cutler City. The national forest land is generally well stocked with small sawtimber. This timber is being harvested and replanted. There is a moderate brush problem. The privately owned forest land has been cutover and is not covered by brush in the lower portions with conifer reproduction beginning to appear on the hills. Recreation residences and resorts are replacing the noncommercial forest in several areas near the ocean.

Watershed Problems and Needs. Approximately 550 acres is flooded annually. The affected land is generally pasture and range land, but with flood protection measures some of this land could be cropped. Flooding occurs mainly on Drift and Schooner Creeks. These two creeks also experience quite a bit of bank cutting and debris damage. Tide gates and diking as well as upstream storage are needed to minimize these problems.

Estimates show that 450 acres of arable land needs subsurface drainage; this includes both open and closed drains with adequate outlets.

Approximately 800 acres of additional land is suitable for irrigation development. Natural streamflow is adequate for 700 acres while storage

would be needed to completely develop the potential. Two reservoir sites were investigated in this watershed, one on Drift Creek (index number 5) with a capacity of 2,160 acre feet and the other on Schooner Creek (index number 4) with a storage capacity of 2,230 acre feet. These sites are suitable for multiple use although the Drift Creek site would have little effect on flood protection due to the large yield of the drainage. Additional small sites exist on smaller tributaries in the watershed. Municipal and domestic water supplies are also needed in this area and could be developed on these streams as proposed by an engineering firm studying future development.

Opportunities under P. L. 566. A project including flood protection, land treatment, channel improvement, and water development for irrigation, municipal, domestic, and recreation might be feasible under existing condition and laws.

Watershed C, Siletz River

Description. The Siletz River watershed contains 195,000 acres in Lincoln and Polk Counties. Seventy percent of the watershed is in the Lincoln Soil and Water Conservation District; the remainder lies in Polk County which is not in a district. The Siletz River is a meandering river originating in the upper reaches of the Coast Range and flowing westerly into the Siletz Bay and on to the Pacific Ocean. Elevations vary from sea level to 3,300 feet with agricultural land extending up as high as 500 feet. Average annual precipitation is 115 inches. The average growing season in the agricultural area exceeds 200 days.

Soils occurring in the watershed include those on the upland, terraces, and flood plains. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. Parent material is igneous materials in the north portion and sedimentary rock in the south portion. Forest is the major use. A small area of terrace soils developed from marine sediments lies around Siletz Bay and south along the coast. They are moderately shallow to very deep, medium to coarse textured and are susceptible to wind erosion when the vegetation is removed. Land use is urban development, recreation, and forest. Flood plain and alluvial terrace soils possess a wide range of characteristics and use suitability. They vary from moderately coarse to fine texture, moderately shallow to very deep, and very poorly to somewhat excessively drained. Agriculture is the most important use but they are also used for forest, urban, and recreation.

A reconnaissance survey indicates there is 11,480 acres used for the production of either crops or livestock. Of this acreage, 3,500 acres is grazed forest; 2,580 acres is range; and 5,400 acres is cropped. About 680 acres is irrigated pasture, hay, berries, specialty crops, and vegetables. On the nonirrigated land, pasture and hay are the largest acreage with smaller acreages of grain, berries, orchards, and specialty crops. This watershed contains 170 farms.

Approximately 169,220 acres, or 87 percent of this watershed, is forested. This large watershed which has been cutover and burned at various times in the past 100 years still contains some stands of the largest trees in Oregon. In June 1964, Boise-Cascade Corporation cut a spruce which was

12 feet in diameter. Except for the pockets of old-growth, the sawtimber is less than 100 years old. Large cutover areas are covered with low-growing brush which the young fir is just starting to overtop.

Watershed Problems and Needs. Approximately 2,500 acres, generally along the lower reaches and near the mouth of the river, is flooded annually. Flood damage has been generally confined to rangeland, cropland, dikes, and buildings. Damage in the lower reaches could be reduced by the installation of dikes and tide gates. Less damage is done in the upstream portions because of the entrenchment of the river channel. Retention of flood waters in this river is beyond the scope of small watershed projects because the average annual yield exceeds 1.5 million acre feet.

Estimates show that 2,000 acres of arable land needs improved drainage.

Approximately 5,000 acres of additional land is suitable for irrigation development. Of this acreage, 90 percent would need stored water while the remaining 10 percent could be irrigated from natural streamflow. Seven reservoir sites (index numbers 6 through 12) on tributaries of the Siletz River were investigated with a total storage potential of around 33,400 acre feet.

Domestic water development on the Siletz River has been proposed by an engineering firm studying future development in the area. Their proposals were for upstream storage and use of salt water barriers near the mouth.

Opportunities under P. L. 566. A project does not appear to be feasible under existing conditions and laws, but a smaller project near the mouth could be feasible for flood protection, water management for irrigation, domestic, and drainage, and land treatment.

Watershed D, Otter Rock

Description. The Otter Rock watershed contains 29,900 acres in Lincoln County. It is in the Lincoln Soil and Water Conservation District. The watershed includes numerous small creeks draining into the Pacific Ocean from Gleneden Beach south to Newport. The area included is approximately 18 miles long and about 3 miles wide. Elevations range from sea level to 1,000 feet. Average annual precipitation is 66 inches. The average growing season is 245 days.

Upland and marine terrace soils occur in the watershed. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to very steep. Parent material is sedimentary rock in most of the area and igneous rock along the coast near Depoe Bay and in a small area in the north. Forest, urban development, and recreation are the uses. Along most of the coastline are terrace soils developed from marine sediments. They are moderately shallow to very deep, medium to coarse textured, and are vulnerable to wind erosion when the vegetation is removed. Land use is recreation, urban development, and forest. Narrow strips of alluvial soils following the streams are used for recreation, forest, and agriculture.

A reconnaissance survey indicates that 110 acres is used for the production of crops and livestock. Of this acreage, 50 acres is grazed forest; 10 acres is range; and 50 acres is cropped. The cropland produces nonirrigated hay and pasture. There are only five farms in this watershed.

Approximately 26,950 acres, or 90 percent of the watershed, is forested. The forests now consist mainly of sapling and pole size fir, spruce, and hemlock, and noncommercial stands of shore pine and spruce along the ocean front. The home builders in the ocean view subdivisions are clearing building sites in the wind-deformed-forest areas.

Watershed Problems and Needs. Flooding problems are minor in this watershed. There is some streambank erosion due to logs and debris. One area east of Newport has unstable soils and bedrock which tend to slip and slide under extremely wet conditions. There has been considerable damage to houses in this area. Domestic and municipal water supply and pollution are becoming more of a problem as this area becomes more populated. This watershed has several state parks and recreational areas that tend to intensify some of the problems.

Estimates show that an additional 70 acres is suitable for irrigation, but whether or not this land is going to be developed for agricultural uses is questionable.

Two reservoir sites (index numbers 13 and 14) were investigated with a combined storage potential of 1,900 acre feet. These sites might have some potential for domestic water supply and recreation.

Opportunities under P. L. 566. A project does not appear to be feasible under existing conditions and laws.

Watershed E, Yaquina River

Description. The Yaquina River watershed contains 158,400 acres in Lincoln, Benton, and Polk Counties. Except for one percent of the area in Polk County, it is in the Lincoln and Benton Soil and Water Conservation Districts. The Yaquina River flows in a westerly direction from the summit of the Coast Range to Yaquina Bay and into the Pacific Ocean at Newport. The watershed area is about 22 miles long and varies in width from 3 miles to 17 miles. Elevations range from sea level to 3,000 feet with most of the agricultural land below 400 feet. Average annual precipitation is 80 inches. The average growing season varies from 248 days at Newport to 195 days at Toledo.

A large area of upland soils, alluvial soils along the streams, and a small area of marine terrace soils make up the watershed. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. The parent material is from sedimentary rock. The major land use is forest. The flood-plain and terrace soils along many miles of streams have a wide range of characteristics and suitability for use. Characteristics vary from moderately coarse to fine texture, moderately shallow to very deep, and very poorly to somewhat excessively drained. These soils support most of the agricultural development and are also used for forest, urban, recreation, and industry. Around the bay, there are soils developed

from marine sediments. They are moderately shallow to very deep, medium to coarse textured and are vulnerable to wind erosion when the vegetation is removed. Land use is urban development, industry, recreation, and forest.

A reconnaissance survey indicates that 15,300 acres is used for the production of either crops or livestock. Of this acreage, 6,700 acres is grazed forest; 2,600 acres is range; and 6,000 acres is cropped. About 900 acres is irrigated pasture, hay, berries, and vegetable crops. The principal crops on the nonirrigated land are hay and pasture although there are some berries, grain, and orchards. There are 180 farms in the watershed.

About 83 percent, or 131,690 acres of this watershed, is forested. Commercial timber harvesting began in 1868 when the first sawmill was built. The timber industry is still going strong even though little thought was given to reforestation in the early days. As a result of this, much of the cutover and repeatedly burned-over land is still covered with brush. In the higher, more remote areas and areas that were protected from fire, good stands of Douglas-fir sawtimber are found. Abandoned farms are returning to forest.

Watershed Problems and Needs. Approximately 1,500 acres is flooded annually. The major areas flooded include Olalla Creek and Depoe Creek drainages in the vicinity of Toledo and areas on the lower reaches of the main river. Some flooding occurs in other areas of the watershed. Flood damage is not too severe in most areas. There is considerable bank erosion along croplands, and in some areas this is quite severe. Channel clearing and alignment are needed to reduce the damage.

Estimates show that 1,500 acres of arable land needs drainage. Approximately 4,500 acres of additional land is suitable for irrigation development. Natural streamflow is adequate for about 500 acres. Storage would be needed to develop the complete potential. Two reservoir sites (index numbers 15 and 16) were investigated with a combined storage of around 5,000 acre feet. Both of these sites are on the Depoe Creek drainage. Other sites would be needed to develop the potential acreage. Industrial and domestic water supplies in the Toledo area are in need of expansion to provide for increased use and to overcome present seasonal shortages.

Opportunities under P. L. 566. A project involving flood protection, drainage, land treatment, and water development for irrigation, water supply, and recreation could be feasible on some parts such as Depoe Creek and Boone Slough but not on the entire watershed under existing conditions and laws.

Watershed F, Beaver Creek

Description. The Beaver Creek watershed contains 31,100 acres in Lincoln County. It is in the Lincoln Soil and Water Conservation District. Beaver Creek flows in a westerly direction entering the Pacific Ocean at a point half way between Newport and Waldport. The watershed is triangular in shape extending along the coastline for about 12 miles and inland about 10 miles. Elevations range from sea level to 1,600 feet with most of the agricultural land below 500 feet. Average annual precipitation is 79 inches. The average growing season is 248 days.

There are upland, marine and alluvial terrace, and flood-plain soils in the watershed. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to very steep. The parent material is from sedimentary rock. The major use is forest. Soils on terraces developed from marine sediments occur in a one to two mile band along the coast. They are moderately shallow to very deep, medium to coarse textured and are vulnerable to wind erosion when the vegetation is removed. Land use is urban, recreation, forest, and range. Flood-plain and alluvial terrace soils occur along the streams. They are moderately coarse to fine textured, moderately shallow to very deep, and very poorly to somewhat exessively drained. These soils are used for most of the agriculture and for forest and recreation.

A reconnaissance survey indicates that 2,210 acres is used for the production of crops or livestock. Of this acreage, 1,000 acres is grazed forest; 510 acres is range; and 700 acres is cropped. About 100 acres is irrigated pasture, hay, berries, and specialty crops. The main crops on the nonirrigated land are hay and pasture with small acreages of berries and specialty crops. There are 20 farms in the watershed.

Approximately 28,460 acres, or 92 percent of the watershed, is forested. The area adjacent to the ocean supports noncommercial shore pine and spruce while inland Douglas-fir and hemlock saplings are just emerging above the brush. Further inland there are stands of sawtimber on the upper slopes and ridges.

Watershed Problems and Needs. Approximately 1,000 acres floods annually. The area affected is mainly pasture and range which has had severe damage due to erosion, sediment, salt water, and debris deposits. Highway bridges, roads, and fences have been damaged quite extensively by erosion and debris. The channel is congested with downed logs and debris. Coastal sand has been moved by wave and wind action into the mouth of Beaver Creek, partially blocking it and causing a flooding problem. Channel clearing and alignment are needed to reduce upstream flooding. Dikes and tide gates are needed to eliminate the sea water.

Estimates show 900 acres of arable land requires improved subsurface drainage. About 500 acres of this is also in need of surface drainage through land shaping and improved outlets.

It is estimated that 1,200 acres of additional land is suitable for irrigation development. Natural streamflow is adequate for 300 acres. The remaining land would require storage. Two reservoir sites (index numbers 17 and 18) with a combined storage potential of 9,000 acre feet were investigated. Both of these sites are well situated to be beneficial as multipurpose structures.

Opportunities under P. L. 566. A project involving water management for irrigation, drainage and recreation, flood protection, channel improvement, and land treatment appears to be feasible.

Watershed G, Alsea River

Description. The Alsea River watershed contains 90,700 acres in Lincoln County. It is in the Lincoln Soil and Water Conservation District. This

watershed contains only the downstream portion of the Alsea drainage from Brush Creek in Section 6, Township 14S, Range 9W. It flows in a westerly direction into the Alsea Bay and on into the Pacific Ocean at Waldport. The watershed area is about 17 miles long and varies from 2 to 17 miles wide. Elevations range from 2,800 feet to sea level with most of the agricultural land below 500 feet. Average annual precipitation is 95 inches with about 8 inches available from June through September. The average growing season in the agricultural area exceeds 200 days.

A large area of upland soils, alluvial soils along the streams, and a small area of marine terrace soils occur in the watershed. The parent material of the upland soils is sedimentary rock. The upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to very steep. Land use is forest, recreation, and urban development. The flood plain and alluvial terrace soils along the streams have a wide variation in characteristics and suitability of use. They vary from moderately coarse to fine texture, moderately shallow to very deep, and very poorly to somewhat excessively drained. Most of the agriculture is on these soils, and they are also used for urban, recreation, and forest. Along the coast and bay, there are soils developed from marine sediments. They are moderately shallow to very deep, medium to coarse textured and are susceptible to wind erosion when the vegetation is removed. Urban development, recreation, and forest are the land uses.

A reconnaissance survey indicates there is 7,800 acres used for the production of either crops or livestock. Of this, 5,200 acres is grazed forest; 1,600 acres is range; and 1,000 acres is cropped. About 300 acres is irrigated pastures, hay, vegetables, and specialty crops. Hay and pasture are the main crops grown on the nonirrigated land along with a small acreage of specialty and vegetable crops. There are 40 farms in the watershed.

Approximately 78,680 acres, or 87 percent of the watershed, is forested. The western portion and most stream bottoms are covered with alder and brush. The rest of the area is covered with Douglas-fir and hemlock. The large blocks of privately owned land in the northeastern portion have been or are being cutover. Forest Service timber harvest has accelerated because of the need to salvage windthrow caused by the Columbus Day storm. Reforestation of clearcuts is being done as a matter of course by both public and private owners.

Waldport's municipal water supply is developed on upper Eckman Creek and tributaries.

Watershed Problems and Needs. Approximately 800 acres is flooded annually. Flooding is mostly along the lower reaches of the Alsea River and Drift Creek. There is no extensive damage because most of the land flooded is undeveloped. Along pasture and cropland areas, there is some bank erosion on tributary streams resulting from debris and logs in the channels. Some of this acreage could be reclaimed by diking and tide gates.

Estimates show 500 acres of arable land requires surface and subsurface drainage.

It is estimated that 1,000 acres of additional land is suitable for irrigation. Four hundred acres of this could be irrigated from existing natural streamflow while the remainder would require storage. One reservoir site (index number 19) with a storage capacity of 3,100 acre feet was investigated.

Opportunities under P. L. 566. A project does not appear to be feasible under existing conditions and laws for the entire area, but a project for some parts of the area could be feasible.

Watershed H, Upper Alsea River

Description. The Upper Alsea River watershed contains 135,500 acres in Benton, Lincoln, and Lane Counties. It is in the Lincoln, Benton, and North Lane Soil and Water Conservation Districts. This watershed contains the upper portion of the Alsea drainage except for Five Rivers. It is approximately 23 miles long and varies from 2 to 17 miles wide. Elevations range from 90 feet to over 3,000 feet. Average annual precipitation is 93 inches with about 7 inches available from June through September. The average growing season in the agricultural area is 190 days.

Two general groups of soils occur in the watershed. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. The parent material is from sedimentary rock in about two-thirds of the watershed and from igneous materials in the remaining third. The major land use is forest, but agriculture and recreation are minor uses. The flood-plain and terrace soils along the streams are used mostly for agriculture and for forest and recreation. They are moderately coarse to fine textured, moderately shallow to very deep, and poorly to somewhat excessively drained.

A reconnaissance survey indicates there is 11,710 acres used for the production of either crops or livestock. Of this, 5,800 acres is grazed forest; 910 acres is range; and 5,000 acres is cropped. About 1,070 acres is irrigated pasture, hay, berries, and vegetable crops. The nonirrigated land is cropped to mainly pasture, hay, and grain with smaller acreages of berries, nuts, and vegetables. There are 110 farms in the watershed.

Approximately 122,900 acres, or 91 percent of this watershed, is forested. Douglas-fir is the primary forest species. In the vicinity of Marys Peak, Douglas-fir and western hemlock are the primary trees. Much of this watershed has been cutover or burned. As with many other watersheds in the basin, brush is found in the stream bottoms with commercial timber species on the hills and ridges. The two forest types are found in varying mixtures on the side hills. The conifers appear to be growing through the brush in many side hill areas.

Watershed Problems and Needs. Approximately 900 acres is flooded annually. A large percentage is cropland, which limits the crops that can be raised. Damage is generally caused by sedimentation and debris deposits. Bank erosion resulting from congested channel conditions also adds to the damages caused from flooding. Irrigation pumping equipment, farm facilities, roads, and bridges receive minor to moderate damage from debris and silt

deposits. In the forested areas, streambank erosion, debris, and silt deposits are a problem. Logging roads received moderate erosion damage.

Estimates show that 2,000 acres of arable land needs improved surface and/or subsurface drainage.

It is estimated that 4,000 acres of additional land is suitable for irrigation development. One-fourth of this area can be irrigated from existing natural streamflow. The remaining acreage would require storage. Three reservoir sites (index numbers 20, 21, and 22) with over 11,000 acre feet of storage potential were investigated. There are numerous additional small reservoir sites that would be suitable for small acreages. There is also a need for water development for municipal use in the Alsea area.

Opportunities under P. L. 566. A project to develop water for irrigation, municipal and recreational uses, flood protection, channel improvement, and land treatment might be feasible on all or part of the watershed.

Watershed I, Waconda Beach

Description. The Waconda Beach watershed contains 10,100 acres in Lincoln County. It is in the Lincoln Soil and Water Conservation District. The watershed contains several creeks which drain into the Pacific Ocean between Waldport and Yachats. The largest creek is Big Creek which flows in a westerly direction from Yachats Mountain. The watershed extends along the coast for about 8 miles and inland 5 miles. Elevations range from sea level to 1,700 feet. Average annual precipitation is 87 inches. The average growing season is about 245 days.

Almost equal areas of upland and marine terrace soils and minor areas of flood-plain and alluvial terrace soils occur in the watershed. Those on the upland are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. Parent material is from igneous materials in most of the area and a small portion from sedimentary rock. Land use is mostly forest with some used for urban and recreation. Along the coast and extending inland for one to two miles there are terrace soils developed from marine sediments. They are moderately shallow to very deep, medium to coarse textured and in danger of erosion by the wind when the vegetation is removed. Recreation, urban, and forest are the land uses. Along the streams, there are narrow bands of alluvial soils. They are used for recreation, forest, and agriculture.

A reconnaissance survey indicates there is 80 acres used for the production of either crops or livestock. Of this area, 50 acres is grazed forest; 10 acres is range; and 20 acres is devoted to specialty crops. There are no irrigated crops in this watershed. There are three farms in the watershed.

Even though this is a small watershed with only 9,850 acres of forest, it is important. The southwest Lincoln Water District obtains water from Big Creek and Starr Creek in the central and southern portions. Most of the watershed is within the Siuslaw National Forest and is supporting 10 to 30 year old stands of Douglas-fir and Sitka spruce.

The watershed was burned in 1936 and replanted with fir and spruce. The plantings have done well but alder, salmonberry, and salal have been very competitive.

Watershed Problems and Needs. Only about 10 acres receive annual flooding in this watershed. Flood damage is minor to nonexistent. There is some evidence of slight erosion on unimproved roads and trails.

Estimates show that 20 acres of additional land is suitable for irrigation. There is sufficient water in the watershed to develop the small acreage of potentially irrigable land.

This watershed contains several beaches and parks with various recreational facilities. There are also numerous summer homes and tourist facilities.

Opportunities under P. L. 566. A project has no possibilities under existing conditions and laws.

Watershed J, Yachats River

Description. The Yachats River watershed contains 28,500 acres in Lincoln and Lane Counties. It is in the Lincoln and Siuslaw Soil and Water Conservation Districts. The river flows in a westerly direction from the Yachats Mountain to the Pacific Ocean at Yachats. The watershed is about 12 miles long and varies from 1 to 10 miles wide. Elevations range from sea level to over 2,300 feet with most of the agricultural land below 250 feet. Average annual precipitation is 100 inches. The average growing season is about 245 days in the agricultural area.

A large area of upland soils and a small area of flood-plain and alluvial terrace soils are in the watershed. The west one-third is developed in material from igneous rock, and the east two-thirds is from sedimentary rock. The soils are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. The land use is forest, urban, and recreation. Flood-plain and alluvial terrace soils have a wide variation in characteristics and are suitable for most uses. They are characterized by moderately coarse to fine texture, moderately shallow to very deep profiles, and very poorly to somewhat excessively drained. These soils support most of the agricultural development and are also used for forest, urban, and recreation.

A reconnaissance survey indicates there is 1,590 acres used for the production of either crops or livestock. Of this acreage, 700 acres is grazed forest; 290 acres is range; and 600 acres is cropped. About 70 acres is irrigated pasture, hay, berries and some vegetable crops. The nonirrigated cropland produces pasture, hay, and berries. There are 20 farms in the watershed.

Approximately 25,950 acres of this watershed is forested. Almost all is owned by the Federal Government or one of several large timber companies. Douglas-fir is the primary species, but there are some alder and brush in the recently logged areas. The major commercial stands are found on the

higher slopes and ridges. The lower slopes and forested stream bottoms have scattered patches of fir and rather extensive stands of brush and alder.

Watershed Problems and Needs. About 100 acres is flooded annually. This land is mainly in pasture with minor damage occurring. There are some streambank erosion and debris deposits in the lower reaches. Minor erosion occurs in the forested areas on roads and skid trails.

Estimates show that 100 acres of arable land needs improved subsurface drainage.

Approximately 700 acres of additional land is suitable for irrigation. Natural streamflow is adequate for about 200 acres. The remaining 500 acres would require the development of storage facilities. Two reservoir sites (index numbers 23 and 24) were studied in conjunction with this report. The combined storage potential of the two sites exceeds 5,000 acre feet.

The soils in the south and east portions of the watershed tend to be unstable, and the Forest Service has indicated a need for special considerations when soil in this area is to be disturbed.

Opportunities under P. L. 566 A project has little possibility under existing conditions and laws.

Watershed K, Five Rivers

Description. The Five Rivers watershed, a tributary of the Alsea River, contains 77,300 acres in Benton, Lincoln, and Lane Counties. It is in the Benton, Lincoln, Siuslaw, and Mid-Lane Soil and Water Conservation Districts. The watershed contains two main streams, Five Rivers and Lobster Creek, which flow to the west. Five Rivers enters the Alsea River at a point in Section 7, Township 14S, Range 9W. Elevations range from 120 feet to over 3,400 feet with most of the agricultural land below 500 feet. The average annual precipitation is 96 inches, and the average growing season in the agricultural area is around 190 days.

Occuring in the watershed are upland soils developed in material from sedimentary and igneous rock and valley soils from alluvium. The upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. Forest is the major use, and agriculture and recreation are minor uses. Flood-plain and terrace soils from alluvial sediments possess variations in characteristics and potential for use. They are moderately coarse to fine textured, moderately shallow to very deep, and poorly to somewhat excessively drained. Agriculture is the main use and recreation and forest are minor uses for these soils.

A reconnaissance survey indicates there is 3,630 acres used for the production of either crops or livestock Of this acreage, 1,000 acres is grazed forest; 1,000 acres is range; and 1,630 acres is cropped. About 440 acres of cropland is irrigated pasture, hay, mint, berries, and vegetable crops. The nonirrigated cropland produces mainly hay and pasture in addition to small acreages of berries and vegetables. There are 40 farms in the watershed.

About 72,790 acres of the watershed is forested. There are extensive stands of young Douglas-fir sawtimber in the western portion of this watershed. The private land in the eastern third of the drainage has been cutover during the past few years. Seed blocks were left, and there are now good stands of young growth with only scattered patches of heavy brush.

Watershed Problems and Needs. Approximately 400 acres is flooded annually. Flooding, in general, is on cropland that is used for pasture. Damage is moderate with some gullying, streambank erosion, and cutting. Fences and farm facilities receive some damage from debris and sediment deposits. There is also some moderate damage to roads and bridges. These problem areas are quite scattered.

Access roads are being constructed by all forest owners. Many are using some care in location and construction. Even though this watershed has areas of unstable soils, erosion caused by road construction does not appear to be extensive.

It is estimated that 120 acres of arable land is in need of improved subsurface drainage.

About 700 acres of additional land is suitable for irrigation. Natural streamflow is adequate for about 200 acres. Reservoir storage facilities would be necessary to develop the potential. Three reservoir sites (index numbers 25, 26 and 27) were studied for this purpose. There is a combined storage potential of 3,850 acre feet which would be adequate for irrigation development.

Opportunities under P. L. 566. A project has little possibility under existing conditions and laws.

Watershed L, Lake Creek

Description. The Lake Creek watershed, a tributary of the Siuslaw River, contains 144,600 acres in Lane and Benton Counties. It is in the Benton, Siuslaw, and North Lane Soil and Water Conservation Districts. This watershed contains three main drainages, Lake Creek and two of its tributaries, Deadwood Creek, and Indian Creek. Lake Creek flows in a southwesterly direction from the Coast Range to Swisshome where it enters the Siuslaw River. The watershed is about 24 miles in length and varies from 5 to 14 miles wide. Elevations range from 120 feet to over 3,000 feet with the majority of the cropland below 750 feet. Average annual precipitation is 92 inches with an average growing season of 180 days in the agricultural area.

A large area of upland soils developed from sedimentary rock, a minor area of upland soils developed from igneous materials, and soils developed from alluvium comprise the soil resource of the watershed. Those on the upland are medium to moderately fine textured, moderately to very deep, and nearly level to very steep. They are used for forest, agriculture, and recreation. The alluvial soils on the flood plains and terraces possess a wide variation in characteristics and use potential. Characteristics vary from moderately coarse to fine texture, moderately shallow to very deep, and poorly

to somewhat excessively drained. Most of the agriculture is supported by these soils, and forest, urban, and recreation are other uses.

A reconnaissance survey indicates there is 9,200 acres used for the production of either crops or livestock. Of this acreage, 2,500 acres is grazed forest; 1,000 acres is range; and 5,700 acres is cropped. About 1,070 acres is irrigated hay, pasture, and corn silage. The nonirrigated cropland produces hay, pasture, and grain. There are 90 farms in the watershed.

Approximately 131,800 acres, or 91 percent of the watershed, is forested. There are extensive stands of young-growth fir interspersed with patches of brush in the older burned or cutover areas. Scattered throughout the entire drainage are old snags sticking through the forest canopy.

Watershed Problems and Needs. Estimates show that 2,000 acres is flooded annually. Damages range from slight to moderate with debris and sediment deposition being the greatest problem. Bank cutting is a problem through areas of cropland, but sheet and rill erosion on the land is minor because most of the cropland is in pasture. Flooding causes moderate damage to road bridges and some farm facilities, mainly fences. In the forested areas, erosion is noticeable on poorly planned trails, skid roads, and haul roads (photo 36). Flooding around Triangle Lake causes moderate damage; this is due to debris deposits and partially to a restricted outlet. Approximately 1,000 acres of arable land needs drainage. Subsurface drainage is needed on the total area as well as improved outlets on about 30 acres.

It has been estimated that 3,000 acres of additional land is suitable for irrigation. Natural streamflow is adequate for about 500 acres. To develop the remaining acreage, storage facilities would be required. Five reservoir sites (index numbers 28 through 32) were investigated with a combined storage potential of 12,260 acre feet.

Opportunities under P. L. 566. A project for flood protection, channel improvement, water management for irrigation, drainage, recreation, and land treatment appears to be feasible for all or portions of the watershed.

Watershed M, North Lane Coast

Description. The North Lane Coast watershed contains 55,800 acres in Lane and Lincoln Counties. It is in the Lincoln and Siuslaw Soil and Water Conservation Districts. This watershed includes a group of small drainages along the coast between Yachats and Sea Lion Caves. The largest of these streams are Tenmile Creek and Big Creek which flow in a westerly direction to the Pacific Ocean. The watershed includes 15 miles of coast line and extends 11 miles inland. Elevations range from sea level to 2,300 feet with the cropland below 400 feet. Average annual precipitation is 96 inches. The growing season is 240 days.

There are upland, marine and alluvial terrace, and flood-plain soils in the watershed. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. Parent material is from both igneous materials and sedimentary rock with most of it being igneous

Photo 36.--Hill side in the background was logged with a tractor. The logs were then dragged through the stream to be loaded on a truck and hauled to the mill. Poppino photo NO. 4

materials. Forest, urban, and recreation are the uses. Terrace soils developed from marine sediments occur along the coast at the mouths of the drainages, principally Bob, Tenmile, Mill, Big, and China Creeks. They are moderately shallow to very deep, medium to coarse textured and are vulnerable to wind erosion when the vegetation is removed. Land use is forest, urban, and recreation. Flood-plain and alluvial terrace soils have a wide range of characteristics and suitability for use. They vary from moderately coarse to fine texture, moderately shallow to very deep, and very poor to somewhat excessively drained. These soils are used for agriculture, recreation, and forest.

A reconnaissance survey indicates there is 1,300 acres used for either crop or livestock production. Of this acreage, 700 acres is grazed forest; 300 acres is range; and 300 acres is cropped. All the cropland in this watershed is nonirrigated pasture and hay. There are 10 farms in the watershed.

Approximately 54,150 acres, of 97 percent of the North Lane Coast area, is forested. The timber stands vary from 30 to 110 years in age, with a few scattered patches of old growth. Following fires in the 1800's, the north slopes and creek bottoms apparently were regenerated first, followed later by ridgetops and south slopes. A few fern openings still persist. Extensive areas reseeded to red alder. Although the area has great timber producing potential, little timber has been harvested because most stands are under 70 years old and lack sufficient volume to support necessary access road construction.

Watershed Problems and Needs. Approximately 200 acres floods annually. Most of this area is on the lower reaches of Tenmile Creek and Big Creek. Fences, roads, and bridges receive moderate damage from debris and sediment deposits. There is some erosion and bank cutting on cropland. Roads and skid trails are quite badly eroded in some areas with a few slides and slumps indicating unstable soil conditions.

Estimates show that 20 acres of arable land need drainage. This could be accomplished with the installation of subsurface closed drains. It has been estimated that 250 acres of additional land is suitable for irrigation. Storage would be required for 50 acres while the remainder could be irrigated from natural streamflow. One reservoir site (index number 33) on Big Creek was investigated with a potential storage of 1,860 acre feet. This watershed probably has more recreational development potential than agriculture. There is also some need for additional domestic water along the coast as development and usage increase.

Opportunities under P. L. 566. A project does not appear to be feasible under existing conditions and laws.

Watershed N, North Florence

Description. The North Florence watershed contains 13,600 acres in Lane County. It is in the Siuslaw Soil and Water Conservation District. This watershed contains several small streams draining into Mercer and Sutton Lakes. Also, there are several additional lakes and streams in the sand dunes. The watershed extends for 5-1/2 miles along the coast from Sea Lion Caves to Heceta Beach. Elevations range from sea level to 1,469 feet. The average annual precipitation is 77 inches. Average growing season is 245 days.

Soils occurring in the watershed include those on the uplands, marine terraces, and flood plain along the streams. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. The parent material is from both igneous and sedimentary rock with approximately equal areas of each. The uses are forest, recreation, urban, and agriculture. The area along the coast and inland to Sutton and Mercer Lakes, comprising about one-third of the watershed, has soils developed from marine sediments. They are moderately shallow to very deep, medium to coarse textured and are vulnerable to wind erosion when the vegetation is removed. The land use is forest, recreation, urban, and agriculture. Alluvial soils along the streams are moderately coarse to fine textured, moderately shallow to very deep, and poorly to somewhat excessively drained. The land use is agriculture, forest, urban, and recreation.

A reconnaissance survey indicates there is 750 acres used for either crop or livestock production. Of this acreage, 300 acres is grazed forest; 50 acres is range; and 400 acres is cropped. Only 10 acres of cropland is irrigated with vegetables and cranberries being raised. The nonirrigated cropland is producing pasture and hay. There are 20 farms in the watershed.

Approximately 10,350 acres, or 83 percent of the watershed, is forested. The forests vary from windblown, deformed shore pine to tall straight Douglas-fir sawtimber. The shore pine grows on the recently stabilized dunes. The fairly low hills east of Highway 101 are covered with scattered fir and patches of heavy brush. The sawtimber is found on the hills near the head of the drainage.

Watershed Problems and Needs. Approximately 100 acres are flooded annually. In general, flooding occurs in the lower reaches of the streams emptying into Sutton and Mercer Lakes. Flood damage, mainly erosion and sedimentation, ranges from slight to severe on cropland. Farm facilities, fences, roads, and bridges receive some moderate damage from debris and sediment deposits. There is also some high water damage to urban property along the lake.

Channel enlargement and clearing between Mercer and Sutton Lakes are needed to reduce flooding of roads and urban property. In the forested areas, erosion is a problem on haul roads and skid trails.

Estimates show that subsurface drainage is needed on 100 acres of arable land.

About 150 acres of additional land is suitable for irrigation. There appears to be an adequate supply of underground water and natural streamflow to develop the potential.

There is a definite need for an improved domestic water supply due to considerable contamination from sewage and large amounts of iron and sulphur found in the lower layers of ground water. This problem is found mostly along Highway 101 in the Sutton Lake area at the present time, but as the population increases, the problem will become more acute.

Opportunities under P. L. 566. A project does not appear to be feasible under existing conditions and laws.

Watershed O, North Fork Siuslaw River

Description. The North Fork Siuslaw River watershed, a tributary of the Siuslaw River, contains 44,000 acres in Lane County. It is in the Siuslaw Soil and Water Conservation District. The North Fork Siuslaw River flows in a southwesterly direction from Saddle Mountain to its confluence with the Siuslaw River about one mile east of Florence. The watershed is approximately 17 miles long and varies from 2 miles to 8 miles wide. Elevations range from about 14 feet to 2,297 feet with most of the agricultural land below 250 feet. The average annual precipitation is 87 inches, ranging from 70 inches at Florence to over 100 inches in the upper reaches of the watershed. The average growing season in the agricultural area is around 240 days.

Three general groups of soils occur in the watershed. There is a large area of upland soils developed from sedimentary rock and a small area developed from igneous materials. They are medium to moderately fine textured, moderately to very deep, and nearly level to very steep, The land use is mainly forest with agriculture and recreation being minor uses. A small area on the west side of the river near its mouth has soils on a terrace developed from marine sediments. They are moderately shallow to very deep, medium to coarse textured, and in danger of erosion by the wind when the vegetation is removed. Urban, recreation, and forest are the land uses. Flood-plain and alluvial terrace soils occur along the streams. Characteristics vary from moderately coarse to fine texture, moderately shallow to very deep, and very poorly to somewhat excessively drained. There are also relatively large areas of organic soils. These soils support most of the agriculture and are also used for urban, forest, and recreation.

A reconnaissance survey indicates there is 3,600 acres used for the production of either crops or livestock. Of this acreage, 300 acres is grazed forest; 400 acres is range; and 2,900 acres is cropped. About 450 acres is irrigated pasture and hay. The nonirrigated cropland produces mostly hay and pasture with some grass seed and orchards. There are 50 farms in this watershed.

Approximately 39,600 acres, or 90 percent of the watershed, is forested. There is a good stand of second-growth Douglas-fir with slender, tall growing red alder trees in scattered patches. The Douglas-fir is also tall and slender. Trees with 125 feet of merchantable logs are not uncommon. The logged over land in the stream bottom has almost no fir reproduction under a heavy brush stand, but the clearcuts in the higher elevations have Douglas-fir seedlings overtopping the brush.

Watershed Problems and Needs. Approximately 2,000 acres is flooded annually. Severe flooding occurs on part of the cropland with erosion, sedimentation, and debris deposits resulting. There is also moderate to slight flooding on an additional large acreage of cropland. Irrigation facilities, fences, roads, and bridges are subjected to flood damage. Bank erosion is a serious problem along several of the streams in the watershed. Pastures and ranges are also damaged by salt water contamination during high tides. About 7 miles of dikes in various stages of repair protect a large portion of the land from normal tides. Additional dikes and tide gates would be beneficial. Forested areas receive some flooding. Damage varies from slight to moderate with erosion to roads and skid trails most noticeable.

Estimates show that 1,500 acres of arable land needs drainage. Improved outlets and open and closed subsurface drainage are needed to reduce this problem.

It is estimated that 1,500 acres of additional land is suitable for irrigation. Half of this acreage could be irrigated with existing natural streamflow; the remainder would need storage development. Four reservoir sites (index numbers 34 through 37) were investigated in this watershed with multipurpose storage potential. Total storage potential of the four reservoirs exceeds 7,000 acre feet.

Opportunities under P. L. 566. A project including flood protection, channel improvement, and water management for drainage, irrigation, and recreation appears to be feasible.

Watershed P, Siuslaw River

Description. The Siuslaw River watershed contains 105,000 acres in Lane and Douglas Counties. This watershed includes the main stem Siuslaw River from the Pacific Ocean upstream to its junction with Wildcat Creek at Austa except for the major drainages of North Fork Siuslaw, Lake Creek, and the minor drainage of Watershed S as shown on map 8. The watershed is in the Siuslaw and Umpqua Soil and Water Conservation Districts. Elevations range from sea level to over 2,300 feet with most of the agricultural land below 250 feet. The average annual precipitation is 86 inches with a range of 60 inches along the coast to over 90 inches above Mapleton. The average growing season in the agricultural area exceeds 200 days.

A large area of upland soils developed from sedimentary rock, an area on the coastal plain near Florence of soils developed from marine sediments, and alluvial soils along the streams occur in the watershed. The upland soils are moderately to very deep, medium to moderately fine texture, and nearly level to extremely steep. Land uses are forest, recreation, urban, and agriculture. The soils from marine sediments are moderately shallow to very deep, medium to coarse textured and are susceptible to wind erosion. They are used for urban, recreation, and forest. The flood-plain and alluvial terrace soils have a wide variation in characteristics and suitability of use. They vary from moderately coarse to fine texture, moderately shallow to very deep, and very poorly to somewhat excessively drained. Also included are relatively large areas of organic soils. Most of the agriculture is on these soils, with urban, recreation, and forest as other uses.

A reconnaissance survey indicates that there is 2,940 acres used for the production of either crops or livestock. Of this acreage, 800 acres is grazed forest; 240 acres is range; and 1,900 acres is cropped. About 70 acres is irrigated hay and pasture. The nonirrigated cropland produces mostly pasture and hay with some small acreages in orchards, cut flowers, and bulbs. There are 50 farms in the watershed.

Approximately 89,850 acres, or 86 percent of the watershed, is forested. The private forest land has been cutover and is now growing Douglas-fir poles although alder and other deciduous species are very heavy near the streams and on the lower slopes of hills. On the upper slopes, the fir poles and small sawtimber have outstripped any competion they may have had and are now growing rapidly.

Watershed Problems and Needs. Approximately 1,500 acres is flooded annually. Flooding is from moderate to severe, but in most areas it is not considered a serious problem. Fences, roads, and bridges receive moderate damage due to debris and sediment deposits.

Roadbuilding and logging on the steep slopes can cause erosion problems as happened on a small side drainage shown in photo 37. The direct cause of this slide was not determined, but it is possible that a debris dam washed out.

Photo 37.--This tangle of mud, brush, and logging debris was deposited on the railroad in the foreground. Poppino photo NO. 5

The maintenance of existing dikes and construction of new dikes are needed to reduce the salt water contamination problem on pasture and range land. Estimates show that 1,000 acres of arable land needs improved subsurface drainage. About half of this area needs improved outlets to reduce the existing problems.

It is estimated that 1,200 acres of additional land is suitable for irrigation development. Half of this acreage could be irrigated from natural streamflow. Reservoir storage would be required to develop the remaining potential land. Two reservoir sites (index numbers 38 and 39) were investigated with a total storage capacity of 3,600 acre feet.

Another serious problem is the contamination of domestic water supplies from inadequate sewage systems. In the area north of Florence to Heceta Beach, this is a very serious problem especially in the older urban areas.

Opportunities under P. L. 566. A project has little possibility under existing conditions and laws.

Watershed Q, Wildcat Creek

Description. The Wildcat Creek watershed, a tributary of the Siuslaw River, contains 34,900 acres in Lane County. It is in the Siuslaw and Mid-Lane Soil and Water Conservation Districts. Wildcat Creek flows in a westerly direction from its headwaters in the Coast Range to its confluence with

the Siuslaw River at Austa. The watershed is triangular in shape with a distance of about 10 miles in each direction. Elevations range from around 300 feet to over 1,800 feet with most of the agricultural land below 500 feet. The average annual precipitation is 65 inches. The average growing season in the agricultural area is about 190 days.

The uplands have soils derived from sedimentary rock, and the valleys have terrace and flood-plain soils derived from alluvium. Upland soils are medium to moderately fine textured, moderately to very deep, and nearly level to very steep. They are used primarily for forest, but minor uses include agriculture and recreation. The alluvial terrace and flood-plain soils are used mainly for agriculture and secondarily for forest and recreation. They are moderately coarse to fine textured, moderately shallow to very deep, and poorly to somewhat excessively drained.

A reconnaissance survey indicates there is 2,100 acres used for the production of either crops or livestock. Of this acreage, 900 acres is grazed forest; 300 acres is range; and 900 acres is cropped. About 50 acres is irrigated pasture and hay. The nonirrigated cropland produces pasture, hay, grain, and orchards. There are 30 farms in the watershed.

Approximately 32,170 acres, or 92 percent of the watershed, is forested. The cover ranges from pure stands of young fir to fir stands mixed with scattered brush patches. Landowners in the upper portions of this watershed are improving their timber stands by felling snags and salvaging residual, old-growth seed trees; but there is alder laying in the streams, setting the stage for debris dams with their attendant problems.

Watershed Problems and Needs. Flooding is a problem on approximately 100 acres of cropland. Streambank erosion cuts into fields and debris, and sediment deposits build up on the land. Fences, roads, and bridges are also damaged by debris from flooding. There is some erosion on forest roads and trails, and some forest land experiences moderate flooding.

Estimates show that 50 acres of arable land needs improved subsurface drainage. It is estimated that 600 acres of additional land is suitable for irrigation development. Streamflow is adequate for about 200 acres. The remaining acreage will need storage developed before irrigation could be accomplished. One reservoir site (index number 40) on Chickahominy Creek with a storage capacity of 1,530 acre feet was investigated.

Opportunities under P. L. 566. A project does not appear to be feasible under existing conditions and laws.

Watershed R, Upper Siuslaw River

Description. The Upper Siuslaw River watershed, a tributary of the Siuslaw River, contains 169,100 acres in Lane and Douglas Counties. This watershed contains all the Siuslaw River drainage upstream from the confluence with Wildcat Creek. It is in the Siuslaw, Umpqua, North Douglas, Mid-Lane, and Upper Willamette Soil and Water Conservation Districts. The watershed is about 33 miles long and varies from 6 to 13 miles wide. Elevations range from around 300 feet to over 2,300 feet with most of the cropland

below 750 feet. Average annual precipitation is 50 inches ranging from 90 inches in the lower reaches to 35 inches at Lorane. The average growing season in the Lorane area is 166 days.

An extensive system of narrow sinuous valleys dissect the sedimentary and volcanic uplands of this watershed. The streams in these valleys have formed alluvial terraces and flood plains by depositing sediment which originated in the hills. These soils possess a wide range of characteristics and use potential. They vary from moderately coarse to fine texture, moderately shallow to very deep, and poorly to somewhat excessively drained. They are used for agriculture, recreation, forest, and urban. The upland soils are developed from sedimentary rock except for a three to five mile strip along the east end of the watershed near Lorane which has soils developed from volcanic materials. They are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. Forest is the major use, but other uses include agriculture and recreation.

A reconnaissance survey indicates that 9,700 acres is used for either crop or livestock production. Of this acreage, 2,300 acres is grazed forest; 1,800 acres is range; and 5,600 acres is cropped. About 450 acres of cropland is irrigated pasture and hay. The nonirrigated cropland produces pasture, hay, grain, and orchard crops. There are 80 farms in the watershed.

Approximately 157,340 acres, or 93 percent of the Upper Siuslaw River watershed, is forested. Significant portions of this area have been cutover with poor to good Douglas-fir reproduction coming back. In some areas, mainly stream bottoms and the wetter sites, brush is a real deterrent to conifer reproduction. In the upper reaches near Lorane, some of the lower slopes have been grazed after logging, and no reproduction is evident. In the higher elevations of the lower half of the watershed, very good timber is found. This watershed has some of the best timber growing land in the state.

Watershed Problems and Needs. Approximately 1,300 acres flood annually. Flooding damage is moderate on cropland and forest land. It is usually in the form of debris deposits and sedimentation. There is some erosion on cropland in areas where crops other than hay and pasture are grown. Inundation limits the crops that can be grown in some areas. Irrigation facilities, farm fences, roads, and bridges receive flood damage from debris deposits. There is considerable evidence of bank cutting on the main channel and tributary streams. Channel clearing and alignment would reduce the flooding problems in some areas.

When this area was originally logged, no thought was given to reforestation or erosion prevention. Erosion is still occurring on some of the old skid roads which ran down the hill with no water diversions. Large areas which should be covered with 20-year-old fir are still growing only brush.

It is estimated that 1,500 acres of arable land needs improved subsurface drainage. Part of this area also needs improved outlets and land shaping.

Estimates show that 1,600 acres of additional land is suitable for irrigation development. Less than half of this area can be irrigated from

natural streamflow. The remainder would need storage developed. In the area northeast of Lorane which is served by Hawley and Norris Creeks, a seasonal shortage of irrigation water already exists. Seven reservoir sites (index numbers 41 through 47) were investigated in this watershed. Four of these in the area of Lorane have a storage potential of 6,300 acre feet. The other three are farther downstream in more isolated areas with an additional storage potential of 8,800 acre feet.

There is some shortage of domestic water for yards and gardens in the Lorane area.

Opportunities under P. L. 566. A project to develop water for irrigation and recreation uses, flood protection, channel improvement, and land treatment appears to be feasible in the Lorane area and might be feasible for the entire watershed.

Watershed S, Duncan Slough

Description. The Duncan Slough watershed, tributary to the Siuslaw River, contains 7,200 acres in Lane County. It is in the Siuslaw Soil and Water Conservation District. This area includes Lawson and Karnowsky Creeks which flow to the northwest and empty into Duncan Inlet. The watershed is triangular in shape with a distance of about 4 miles in each direction. Elevations range from about 10 feet to over 1,300 feet with most of the cropland below 200 feet. Average annual precipitation is 80 inches. The average growing season in the agricultural area exceeds 200 days.

Soils developed in material from sedimentary rock and those developed on flood plain and terraces from stream deposited sediments occur in this watershed. Those on the upland are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. Land use is predominately forest; agriculture and recreation are minor uses. The area of alluvial soils includes a comparatively large portion along the Siuslaw River and narrow strips along the other streams. These soils are moderately coarse to fine textured, moderately shallow to very deep, and very poorly to somewhat excessively drained. A relatively large area of organic soils also occurs on the flood plain of the Siuslaw River. These soils support most of the agriculture and are suitable for irrigation. Other uses include recreation, urban, and forest.

A reconnaissance survey indicates there is 1,200 acres used for agricultural production. Of this acreage, 300 acres is grazed forest; 200 acres is range; and 700 acres is cropped. Pasture and hay are produced under irrigation on about 100 acres of cropland. The remaining cropland is non-irrigated with pasture and hay also being grown. There are 12 farms in this watershed.

Approximately 5,700 acres, or 79 percent of the watershed, is forested. The steep hills are forested or recently cutover. Forest cover is generally sawtimber size with Douglas-fir on the slopes and ridges and hardwoods in the creek bottoms. The logging activity has been conducted mainly from water level roads although ridgetop roads are now being built. Downhill logging, which is necessary with stream bottom roads, results in numerous watershed management difficulties.

Watershed Problems and Needs. Approximately 500 acres floods annually. Flooding occurs on the lower reaches of Lawson and Karnowsky Creeks and inland between Duncan Inlet and Siuslaw River. Silt and debris deposits resulting from flooding are quite severe on about 400 acres of cropland. Existing diking is inadequate in places, and additional dikes and tide gates are needed to reduce salt water contamination and reduce flooding. There is moderate damage to fences, roads, and bridges from debris and silt deposition. There is some erosion and flooding on forest lands and urban development.

Estimates show 450 acres of arable land needs drainage. All of this acreage needs subsurface drainage, and about 100 acres requires improved outlets.

It is estimated that 400 acres of additional land is suitable for irrigation. To develop this potential, an adequate water supply would be needed. Natural streamflows are only adequate for about 50 acres of additional irrigation. There are no known reservoir sites in the watershed. Irrigation water could be pumped from Duncan Inlet if dikes and tide gates were installed to eliminate salt water.

Opportunities under P. L. 566. A project including flood protection, water management for irrigation and drainage, and land treatment appears to be feasible.

Watershed T, Siltcoos Lake

Description. The Siltcoos Lake watershed contains 84,100 acres in Lane and Douglas Counties. It is in the Siuslaw and Umpqua Soil and Water Conservation Districts. The watershed extends along the coast for 16 miles and includes all the drainages between the Siuslaw River and the Umpqua River. The larger streams are Maple and Fiddle Creeks which are tributary to Tahkenitch Lake. Elevations in the watershed range from sea level to 1,840 feet with most of the cropland below 200 feet. Average annual precipitation is 75 inches. The average growing season in the agricultural area is around 245 days.

Soils in the watershed are developed in material from sedimentary rock, from marine sediments, and from alluvium on the flood plains and terraces. The upland soils, covering most of the eastern two-thirds of the area, are medium to moderately fine textured, moderately to very deep, and nearly level to extremely steep. Forest and recreation are the land uses. In almost a third of the watershed, there are soils developed from marine sediments. These sediments vary from loose, unconsolidated, unvegetated sand along the shore to semi-consolidated sand with a weakly developed profile farther inland. They are moderately shallow to very deep, medium to coarse textured and are vulnerable to wind erosion when vegetation is absent Land use is forest, urban, recreation, and agriculture. Along the streams are flood-plain and terrace soils which are moderately coarse to fine textured, moderately shallow to very deep, and very poorly to somewhat excessively drained. Intermittent small areas of organic soils occur. The land use is agriculture, recreation, urban, and forest.

A reconnaissance survey indicates there is 3,220 acres used for the production of agricultural products. Of this acreage, 700 acres is grazed

forest; 170 acres is range; and 2,350 acres is cropped. Pasture and hay are raised on the cropland; about 460 acres of the 2,350 acres is irrigated. There are 50 farms in the watershed.

Sand dunes comprise about 18,780 acres, or 22 percent, of the area.

Approximately 54,930 acres, or 65 percent of the watershed, is forested with predominately two forest types. Near the coast and at the edge of the dunes, shore pine and Sitka spruce are found. In this area, the trees are generally twisted and otherwise deformed by wind. Their greatest values are for watershed protection and scenic beauty. Farther inland, the forests are composed of Douglas-fir, western hemlock, Sitka spruce, and western red cedar. The timber in this area is being harvested. Noncommercial stands of hardwoods are invading some of the recent clearcuts, but there appears to be conifer reproduction growing under the brush.

Watershed Problems and Needs. Approximately 1,200 acres is flooded annually. Main flooded areas are along Maple, Fiddle, and Fivemile Creeks. Most of the land is cropland with severe flooding adjacent to streams and decreasing some distance away. Damage in general is bank erosion, sedimentation, and debris deposits. Fences, roads, and bridges or culverts require considerable maintenance due to silt and debris. Some erosion is found in forested areas where undesirable logging practices are used.

Wind erosion is a major problem in the dune areas causing encroachment on forests, filling stream outlets and culverts, and increased highway maintenance. Many acres have been planted to European beachgrass or shore pine to control this problem (photos 38 and 39).

Estimates show that 800 acres of land needs improved subsurface drainage. Improved outlets and land shaping are also needed to improve drainage.

It is estimated that 1,900 acres of additional land is suitable for irrigation development. Natural streamflow appears to be adequate for about 1,000 acres. The remainder would need stored water to fully develop. Three reservoir sites (index numbers 48 through 50) were investigated with a combined potential storage of 6,940 acre feet.

Two dams have been built to stabilize the supply of industrial water. These dams are on Siltcoos River and Tahkenitch Creek in the sand dunes. The dunes are recharged and the water pumped out in other areas.

Opportunities under P. L. 566. A project does not appear to be feasible under existing conditions and laws, but a project for some parts of the watershed could be feasible.

Photo 38.--Crew planting European beachgrass to help stabilize the shifting sands. SCS photo NO. 7-1529-2

Photo 39.--Shore pine and Scotch Broom have been planted by the Bureau of Land Management to stabilize the sand dunes. SCS photo NO. 7-1496-7

MEANS TO ACCOMPLISH NEEDED WORK

PROGRAMS OF USDA

Several agencies within the U. S. Department of Agriculture administer programs that are directly concerned with various aspects of water and related land resources. Many of the Department's activities and programs are, or can be, helpful in the solution of problems and the accomplishment of needed work in the Middle Coast Drainage Basin.

COORDINATION OF USDA PROGRAMS AND OTHER BASIN ACTIVITIES

In general, the forestry and agricultural aspects of water and related land resource problems are often intimately connected with uses of land and water for other purposes such as cities and towns, recreation, navigation, industry, and highways. The degree of relationship varies between geographic areas depending primarily upon the resource base available and pressures upon that base.

The U. S. Department of Agriculture is concerned with all agricultural and forest land in the basin and is responsible for the administration of the 29 percent of the basin that is in national forests. The U. S. Department of Interior is responsible for the administration of about 15 percent of the area; therefore, the Federal Government is directly responsible for the administration of approximately 44 percent of the Middle Coast Drainage Basin. The management of this land is an important factor in the economy of the basin and influences the timing of water flows and the quality of water flowing from the upper watersheds.

The Corps of Engineers, U. S. Army under assignment by Congress, is charged with the public civil works program to control, regulate, and improve river and harbor resources, to administer the laws pertaining to the preservation of navigable waters, and to plan, construct, and operate flood control works. Many of the existing and possible future projects under the Corps' jurisdiction affect agricultural lands. Substantial assistance in the solution of basin agricultural problems has and will accrue from the coordination of the Corps' work and that of other interests in the basin.

The Bureau of Reclamation is authorized at the public request to locate, construct, operate, and maintain works for storage, diversion, and development of waters for the reclamation of arid and semiarid lands in the Western States. Projects constructed by the Bureau should be coordinated with other land and water developments in the basin.

Private and municipal water developments for power and industrial uses in some instances affect agricultural and forest lands. In many cases, substantial mutual benefits can result from the coordination of projects so as to solve or mitigate existing problems.

From an agricultural standpoint, there is a need for coordination of effort on present and future problems on an individual, group and project basis. In turn, it is important that agricultural water control and utilization developments recognize to the extent feasible all other land and water uses and values. Such coordination is necessary to secure a reduction instead of a compoundment of mutual problems. Notable coordination has occurred and should be continued. This coordination ranges from informal contacts on individual problems to formal liaison between organizations and agencies on the inter-relationship of major projects.

Future small watershed projects need to be coordinated to insure the inclusion of all feasible features to enhance the use of both the watershed and its waters for all worthwhile purposes. In addition, small watershed projects need to complement other major water projects in the basin and make the best use of improvements provided under other programs.

It is hoped that the information in this report and the data gathered for its preparation will be of assistance to others in future coordination of the water and related land resources in the Middle Coast Drainage Basin.